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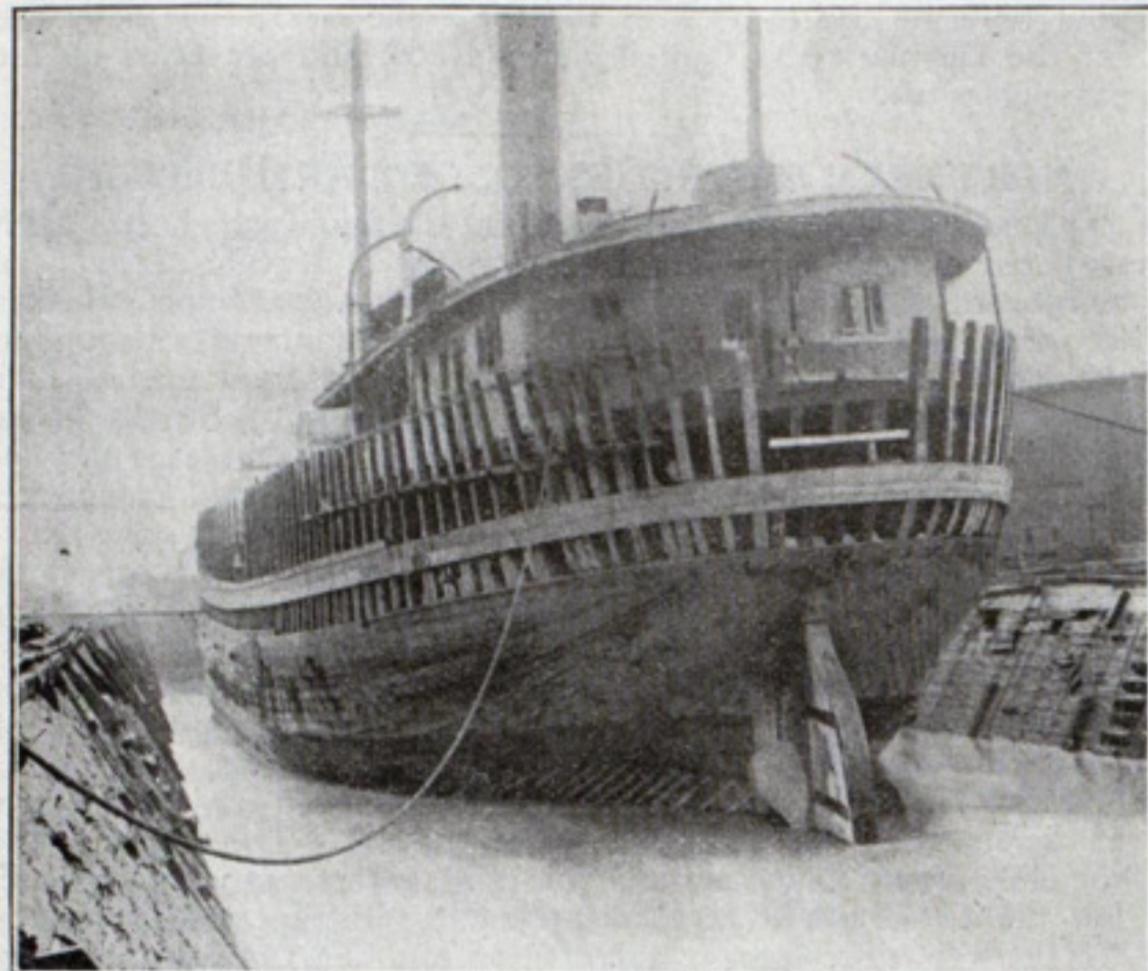
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No. 16

## BUSTLING OF A LUMBER CARRIER.

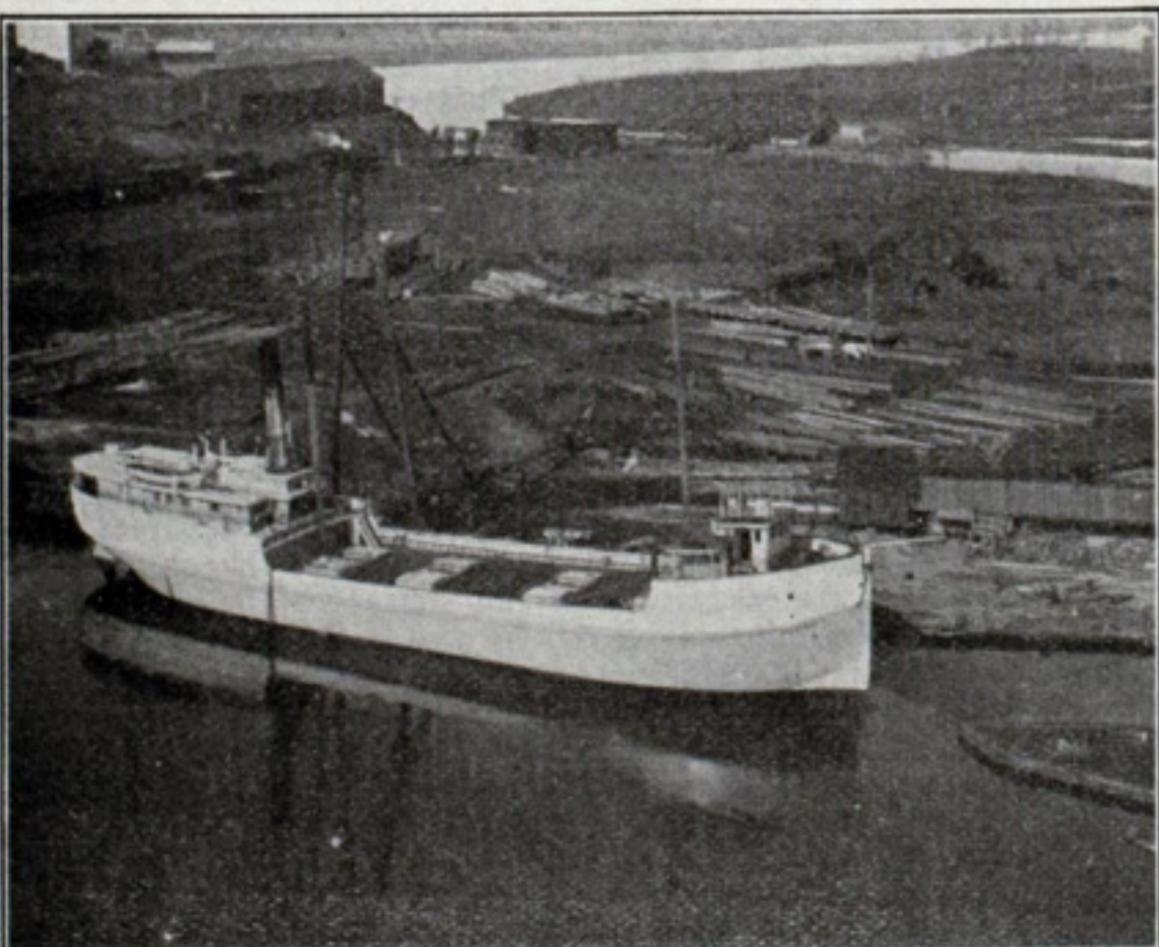
The general reduction of freight rates around the lakes has so reduced the efficiency of tonnage that the small-size vessel, unless engaged in some special trade, is no longer a paying proposition. In order to therefore increase the earning power of lumber carriers, vessel owners having this kind of tonnage on hand have resorted to what is known as bustling, to enable the



Steamer leaving the Dry Dock.

boats to carry more cargo. In some instances a larger deck load was all that was desired and in such cases a straight wedge bustle was added to the vessel; but to-day, with the small lumber vessels handling mostly hardwood, increased displacement is paramount.

Therefore in bustling the steamer John Spry, owned by White Bros. of Boyne City, Mich., at the Manitowoc works of the Manitowoc Dry Dock Co. the job amounted to practically putting new sides to the vessel, parallel to the old, thereby increasing



Steamer Three Brothers after Completion.

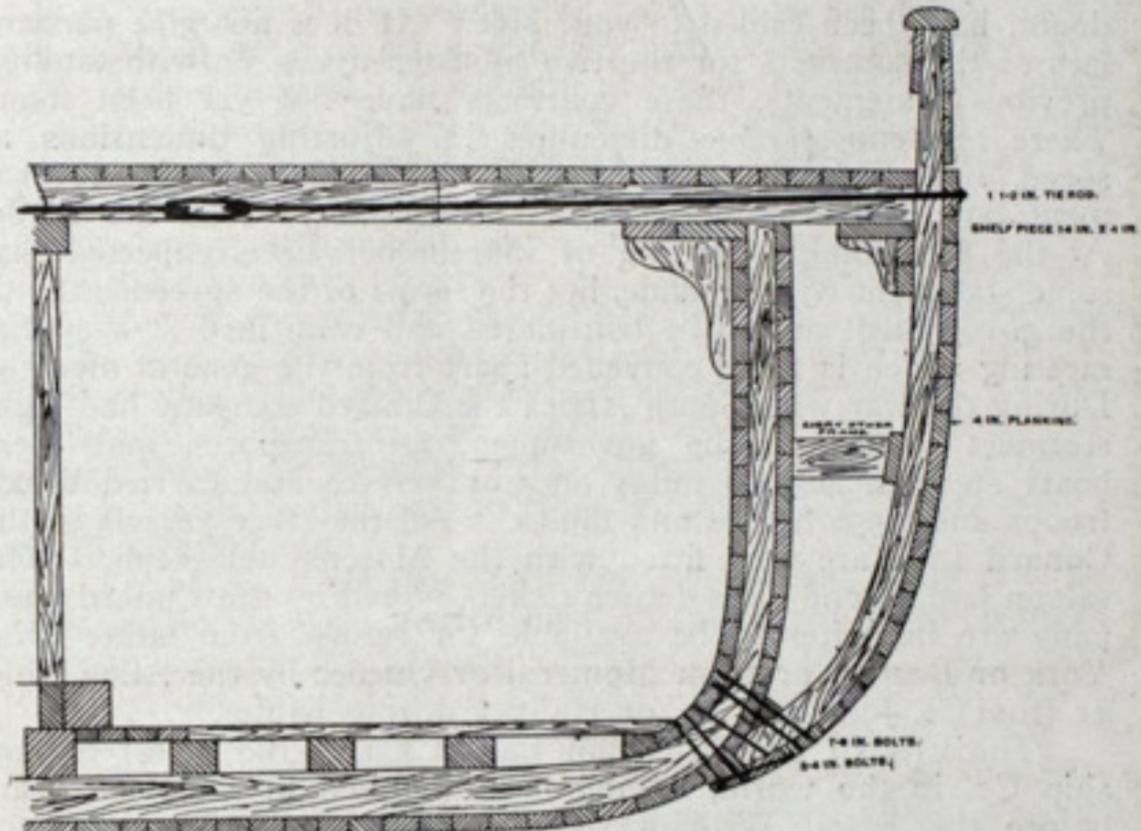
the displacement by about 162½ tons, the beam at the same time being increased about 8 ft.

In the operation of bustling, the old frames and planking are left intact, the new construction making a practically watertight compartment, wedge-shaped and slightly curved at the apex, gradually narrowing until it merges into the old planking a few feet from the stem and stern. The old rail is removed and the

frames cut down to the deck beams, the deck extended to the new shear plank, and a new rail built upon the new frames.

The Spry was docked March 1, and a plank taken out the turn of the bilge. Long lengths of 10x10 in. white oak, hewn pentagonal in shape, were then inserted, as shown in the midship section, and securely bolted to the old frames. The deck beams were pieced out by 8-ft. lengths, and from the beams to the new bilge piece new frames were fitted, being ribboned half way up. The new frames were then securely bolted by  $\frac{7}{8}$  in. bolts through the planking and into the old frames. New outside planking was then started and the first two planks were bolted, both to the new bilge piece and to the planking and frames, through a wedge shaped strip. The scantlings of the new work were everywhere made the same as the old, including the 4-in. planking. The best white oak was used throughout. Half way up to the deck a heavy strut piece was placed on every other frame, and four 1½-in. tie rods with turnbuckles were put in at the deck to counteract any tendency to spread at this point.

The vessel left the dock on March 20 caulked to the sheer plank and by April 1 the work was completed, including painting.



Midship Section showing bustling steamer Three Brothers.

The steamer as completed presents a remarkably fine appearance for a bustled boat, so much so as to agreeably surprise her owners. The lake captains who have seen the vessel are unanimous in saying that the job of bustling is the best ever done on the lakes. Except for her unusual beam, she shows no signs of being bustled, as her upper water lines, while full, are fair and rather pleasing, as the illustration shows.

The steamer will go into commission as reconstructed under the name Three Brothers, in honor of the Messrs. White of Boyne City, Mich., her present owners.

## MARYLAND STEEL CO. WILL BUILD FLOATING DOCK.

Rear Admiral Mordecai T. Endicott, chief of the bureau of yards and docks, has awarded the contract for the construction of the Cavite dry dock to the Maryland Steel Co., Sparrow's Point, Md. It is specified that the dock shall be delivered on the Atlantic coast for \$1,124,000. Rear Admiral Endicott says that the dock is a type which has been developed by the Maryland Steel Co. Owing to the severity of the bending strains on a floating dry dock for warships, it is considered desirable to keep all jointed connections as far from the center of the dock as possible. This condition was met by designing a solid dock and cutting away the pontoons for a short distance from each end of the dock and replacing them with two smaller floating docks. For purposes of towing, this dock is so designed that it will be able to cope successfully with practically all conditions of wind and weather. It is the opinion of the bureau that there is no firm in the United States so well qualified to construct a floating dock of the type proposed as the Maryland Steel Co.

The government is apparently very fond of going into the dredging business. One of the government transports, the Grant, which is no longer needed for transport service, is being turned into a dredge and is to be used for cleaning out the mouth of the Columbia. The Grant is being fitted with large bins and pumps. It appears therefore that she is to be converted into a hopper dredge.

## SCOTCH SHIP BUILDING.

**Small Output of Late—Delay in Ordering the New Cunarders—Fast Steamer for Dublin—Liverpool Mail Service.**

Glasgow, April 6.—The condition of ship building here shows no sign of improvement, for material still keeps high while freights remain depressed. On the northeast coast of England builders seem to have booked a few orders within the last few weeks, which is fortunate for them as trade there was very bad. As to the wages question, both employers and employed have practically accepted the recommendation of the conference of executive councils, to make the proposed reductions in the engine shops date from May 1, but there are some local difficulties within the district, and pertaining to certain classes of workshops, that delay a comprehensive settlement. In the North of England the joiners' strike has been brought to an end by the ship yard joiners agreeing to a reduction of 1s. per week, in two instalments, at an interval of three months, of 6d. per week, instead of 1s. 6d. per week proposed by the employers. They have been twenty-two weeks fighting over this matter and have thrown back the work in the yards to an enormous extent, but then it must be confessed that some of the yards had very little to do anyhow. There is, however, as I have said some improvement now in the ship building industry in the north of England and steel ship plates there have been advanced to £5 17s. 6d. per ton less 2½ per cent., as against £6 less 5 per cent. in Glasgow. In both districts steel manufacturers are rather better employed than they were, though they complain that crude iron is too dear for their profit.

A synopsis of the report of the Cunard company will, no doubt, have been cabled to your side. It does not give particulars of the contracts for the two monster flyers, notwithstanding previous statements, these contracts have not yet been fixed. There are considerable difficulties in adjusting dimensions to speed, and elaborate experiments are being made in the government tank and also in the tank at Denny's yard on the Clyde. At the forthcoming meeting of shareholders it is expected that some statement will be made, but the terms of the agreement with the government are to be considered and confirmed at a special meeting which is to be convened apart from the general meeting. During the war with South Africa the Cunard company had eight steamers loaned to the government as transports, and these boats steamed 405,000 miles on war service and carried 68,000 troops and 6,556 horses and mules. All the large vessels of the Cunard Line are now fitted with the Marconi telegraph. The saloon and second-class return tickets issued by the Cunard company are hereafter to be available for return from either New York or Boston, or from Montreal or Quebec by the Allan Line, or from St. Johns, N. B., or Halifax during winter.

The City of Dublin Steam Packet Co. is the oldest Steamship Co. in the world, having been founded in 1823, ten years before the Royal William steamed from Nova Scotia to the Thames. For this company the Clyde Ship Building & Engineering Co. of Glasgow recently built the Kilkenny, which has just completed her steaming trials on the Firth of Clyde. This vessel, which is of 1,497 tons, is intended for the Dublin to Liverpool mail service, and will be the company's finest steamer on that route. She has accommodation for 154 first-class passengers and 560 steerage, and she will carry, besides, 500 head of cattle and over 1,000 tons of cargo. Triple-expansion engines of 3,500 I. H. P. have been supplied by the builders. Throughout the trials everything worked satisfactorily, full steam pressure of 175 lbs. per square inch being steadily maintained. The speed attained during the entire run was 14.9 knots, which is considerably in excess of the contract speed for fine weather. The trial was carried out under severe weather conditions, and the vessel had on board 610 tons deadweight. The City of Dublin Steam Packet Co. has been eighty years in existence, and its service between Ireland and England had always been carried on with success. This is the sixth vessel built in the yard the Kilkenny came from.

The output of new ships from the Scotch ship building yards in March was seventeen of 34,740 gross tons. This compares with 41,730 tons in February last and with 35,980 tons in March 1902. The Clyde proportion of the March output was twelve vessels and 33,630 tons; the Forth proportion three vessels and 745 tons, and the Dee proportion two vessels and 370 tons. For the three months ended March 31 the total production has been 96,257 tons, of which 87,460 tons was from the Clyde yards. This is the smallest quarterly total for five years, the comparison being with 106,000 tons in 1902, with 112,350 tons in 1901, with 99,930 tons in 1900, and with 117,940 tons in 1899. The largest item in the March output was a 10,500-ton twin-screw steamer built by Alexander Stephen & Sons for the United Steamship Co. of Copenhagen; and the next largest was a 10,000-ton twin-screw steamer built by Caird & Co. for the Peninsular & Oriental Co. These two liners, it will be seen, account for nearly two-thirds of the total tonnage produced. Then there was a Clan liner of 5,200 tons, built by Archibald MacMillan & Co., Ltd.; a 2,750-ton cargo boat, built by Russell & Co., Port Glasgow, for Scotch owners; a 1,400-ton cargo boat built by the Ailsa Ship Building Co. for a Scotch cargo line; a 1,000-ton screw steamer, built by Russell & Co. for the New Ontario Steam Navigation Co., of Hamilton, Canada; a three-

masted sailer of 1,900 tons, built by A. Rodger & Co., Port Glasgow, for Hamburg owners; two or three steam yachts and a number of steam fishing vessels, tugs, etc. Of the total tonnage, 10,500 tons was for Denmark, 1,900 for Germany, 1,000 tons for Canada, 455 tons (a steam yacht) for the United States, 220 tons for Natal, and the rest for the United Kingdom. The new contracts booked during March were just a trifle more than the launches, say about 37,000 tons. They include liners for the Allan Line and the Elder, Dempster Line, to be built by Alexander Stephen & Sons; a 1,400-ton steam yacht for Mr. Vanderbilt of New York, to be built by the Ailsa Ship Building Co.; two boats of 2,000 tons each for the China Mutual Navigation Co. to be built by Scott & Co.; two steamers for Spain to be built by the Grangemouth & Greenock Ship Building Co.; a big dredger for the Clyde trust, to be built by William Simons & Co., and a number of miscellaneous craft, trawlers, etc. The large vessel mentioned above as having been built by Alexander Stephen & Sons for Copenhagen is the third sister ship of the kind built by the same firm for the same owners. They are for the Denmark and United States trade, and are fitted up for passengers and cargo.

## NORTHERN SECURITIES CO. DECLARED ILLEGAL.

Undoubtedly the most important decision which has been rendered by a court in recent years is the one which forbids the merger of the Great Northern and Northern Pacific railways into the Northern Securities Co. The decision was rendered in the United States circuit court of appeals at St. Paul, all four judges on the bench unanimously concurring. Stocks broke sharply when the decision was announced. The base of the decision is that the merger is in restraint of trade and commerce, both lines being competing, and is therefore illegal. The Northern Securities Co. is enjoined from acquiring any more stock in the two railways, is enjoined from voting what it has and is directed to return the stock to its original holders. Considerable surprise was expressed in Wall street as a decision was not looked forward to for some months yet. An appeal will, of course, be taken to the United States supreme court.

The Northern Securities Co. was organized under the laws of the state of New Jersey on Nov. 13, 1901. The object of the company was "to assure a stable and permanent management" for the three great railroad properties in the northwest—the Northern Pacific, the Great Northern and the Chicago, Burlington & Quincy. The idea of forming this holding company is supposed to have originated with James J. Hill, the president and chief owner of the Great Northern. Mr. Hill, in December, 1899, decided that it was necessary for the continued success of his line to get an entrance into Chicago. He tried to buy the Chicago, Milwaukee & St. Paul, but failed. Then he attempted to buy the Burlington and succeeded. When E. H. Harriman and the other interests in the Union Pacific railway heard of this they demanded a share in the control to protect their interests. This was refused. Thereupon the Harriman people began to buy into Northern Pacific, which with the Great Northern, was to have control of the Burlington. This brought about the panic of May, 1901. The contestants for the control, however, came to an understanding by which they were all to receive an interest in the holding company, which would take over the Northern Pacific and Great Northern. The holding corporation was the Northern Securities Co. That company took over very nearly all the common stock of the Great Northern and of the Northern Pacific, the preferred stock of the latter company being retired. When the holding company had obtained its charter the shares of the Great Northern and of the Northern Pacific, practically disappeared from the market. Instead of the shares of the Northern Securities Co. were dealt in. Dividends were paid on these shares out of the dividends declared by the two railroads whose stock the securities company owned.

Soon after this organization, however, it was charged that the Northern Securities Co. was not organized in good faith to purchase and pay for the stocks of the two railway companies; that it never had money enough to do so, and that the only consideration for the transfer to it of the shares of the two railway companies was the issue and delivery of its own shares in payment therefore. Soon afterward three actions were brought in the United States courts to test the legality of the company. One suit was brought for the United States by Attorney General Knox, one by the state of Washington, and one by the state of Minnesota. The latter case was dismissed for lack of jurisdiction. The Washington case was argued before the United States supreme court and decision was reserved. The present decision is in the case brought by the attorney general of the United States. Argument in this case was heard on March 18 in St. Louis under a special act of congress. The case was argued before the United States circuit judges Caldwell, Thayer, Sanborn and Van Deventer. It is of the utmost importance as bearing upon other mergers and consolidations and the outcome of the case in the supreme court will be watched with the greatest concern.

Mr. G. H. Duggan of Montreal has been appointed general manager of the Dominion Iron & Steel Co., vice Mr. Cornelius Shields, elected president of the Consolidated Lake Superior Co.

## BUSY IN YACHT CONSTRUCTION.

**Ship Yards in and About the Metropolis Have Considerable Work Under Way—Yachts, both Steam and Sail, Launches and River Boats.**

In and around New York quite a number of steam yachts, sailing yachts with steam auxiliaries, gasoline, naphtha and electric launches are being built. All of them are of moderate dimensions. The largest is the Haouli, which is 166 ft. on the water line. There are eighteen steam pleasure craft under way. Some of them will make good cruising yachts while some are built only for the sound. These eighteen vessels will cost about \$700,000. Four big yachts with full sail power and fitted with steam engines are being constructed and these will cost about \$395,000. Eight smaller sailing craft with gas engines for auxiliary power are being built and these will cost about \$98,500. Sixty-six power boats of various sizes are being turned out at a cost of \$181,200. Four houseboats are being built at a cost of \$89,000. Altogether ninety-nine vessels belonging to these classes will be seen out this year and they will represent an outlay of about \$1,453,700.

The largest steamer being built, the Haouli, is for F. M. Smith, who is known as the Borax King. Mr. Smith lives in California, but he has a summer home at Shelter Island, and during the summer will use the yacht for cruising along the coast. He is a member of the New York and other yacht clubs, and owns and races the 43-footer Effort. The Haouli is a steel vessel, 211 ft. 3 in. over all, 166 ft. on the water line, 21 ft. 6 in. beam and 6 ft. draught. She is fitted with triple-expansion engines, and they are of sufficient power to drive her 23 knots an hour. The contract specifies that she must make that speed in a continuous run of six hours. The Haouli is being built at the J. N. Robbins Co.'s yard at the Erie Basin, and she was designed by H. J. Gielow. There are to be two mahogany deck houses on the yacht, the forward one 58 ft. long and the after one 42 ft. long. In the forward one will be the dining saloon, which will seat eighteen persons, the pantry, owner's galley and the captain's room. In the after houses there will be a dressing room at the forward end; next will come a room 11 by 13 ft., which will be used as a stateroom and, by an ingenious arrangement of sliding doors, can be thrown into the main saloon, which is in the after end of the house. On the main deck there will be one double stateroom, two large single rooms and three smaller ones. Forward of the engine space will be the crew's quarters, including the forecastle, rooms for the officers, crew's galley and bath rooms. The yacht will be launched this month and will be ready for a trial trip by the end of May. It will take a crew of twenty-six men to run her and she will cost about \$150,000. She will have many novel features in her fittings. She will be lighted by gas as well as have an electric light plant. There will be a refrigerating plant, a distilling plant, and she will carry electric launches on her davits.

At City Island another steamer is being built from Henry J. Gielow's plans. This boat is for Spencer Kellogg of Buffalo, and is being built by Robert Jacob. She is a steel boat, and her dimensions are 126 ft. 8 in. over all, 101 ft. on the water line, 16 ft. beam, and 6 ft. 10 in. draught. She will cost about 45,000 and will have a crew of twelve men. She is to be ready by June, and will be able to make about 16 miles an hour.

The Herreshoffs have turned out two steamers during the winter. One, which has been named Claudia, is for Vice-Commodore Morton F. Plant of the Larchmont Yacht Club. She is 100 ft. on the water line and is a remarkably pretty boat. The other is for Shelah R. Van Dusen, and her dimensions are 130 ft. over all, 110 ft. on the water line and 12 ft. beam. She looks very much like the Ballymena, which was built by the Herreshoffs some years ago. The Claudia will take a crew of twelve men and will cost about \$50,000. The other yacht, which is a little larger than the Claudia will have a crew of fourteen men and her cost will be about \$57,000.

At Morris Heights a number of steamers are being built at the works of the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated. All these boats were designed by Charles L. Seabury, and some are good cruising boats with moderate speed; some are very fast and will be used by their owners chiefly as ferry boats to take them to and from their business and their summer homes, and some are like small houseboats, which will be used on the lakes and rivers. The largest boat at these works is the Aria, which is for Edward H. Blake of Bangor. The dimensions of the Aria are 165 ft. over all, 138 ft. on the water line, 18 ft. beam and 8 ft. 6 in. draught. She is to have a speed of 19 miles an hour and will be ready for launching this month. The owner's quarters, consisting of one double stateroom and three single rooms, are aft. The main saloon is the full width of the ship, and on deck there are two houses, one being the dining saloon and the other the social hall. The officers of the yacht have staterooms, and the forecastle is roomy and well ventilated. The yacht will take about fourteen men to run and her cost will be \$75,000. Next in size to the Aria is the Cherokee which has been built for S. H. Vandergrift of Pittsburgh. The Cherokee is 115 ft. over all, 90 ft. on the water line, 15 ft. beam and 6 ft. draught. She has been designed so that the bow and stern can be taken off in order to allow the vessel to go through the locks on the canals. Mr. Vandergrift has a summer home in the Thousand Islands and will use the

Cherokee on the St. Lawrence. In a speed trial recently she showed 16.1 miles an hour. She will have a crew of eleven men and cost about \$35,000.

Commodore J. A. Mullenhauser has had a twin-screw yacht built at Morris Heights which he has named Corinthia. This vessel is 100 ft. over all, 90 ft. on the water line, 16 ft. beam and 5 ft. draught. She will be used daily by her owner to take him from Glen Cove to New York. Her crew will number nine men, and her cost complete will be about \$35,000. On her trial the Corinthia made 16.1 miles an hour which is more than her contract called for. The steam yacht Inia, which has been built for H. S. F. Davis, is about ready to be put in the water. This boat was built like the Cherokee, in order that she may go through the canals. Her dimensions are 103 ft. over all, 85 ft. on the water line, 15 ft. beam and 5 ft. 6 in. draught. She is built of wood and is very handsomely finished. She will take a crew of eight men, and her cost will be about \$32,000.

The fastest boat turned out at Morris Heights is the Niagara IV. which is for Howard Gould. She will be used as a ferry and run from Port Washington to the city for her owner's use. On her trial recently she did 9 miles in 19 minutes 41 seconds, which is at the rate of 27.43 miles an hour. She is 111 ft. over all, 104 ft. on the water line, 12 ft. beam and 4 ft. draught. She has twin screws, two smokestacks and triple-expansion engines. She will cost about \$27,000, and it will take eight men to run her. Another fast yacht is the Velthra, which has been built for S. Parker Bremer of Boston. She is modeled much like the Vixen, built last year for John D. Archbold, and is 111 ft. over all, 104 ft. on the water line, 12 ft. beam and 4 ft. draught. Her speed is to be 20 miles an hour. She will cost about \$25,000 and it will take eight men to run her. Walter E. Duryea and R. N. Gilbert are each having small steamers built which will be used on the St. Lawrence. Mr. Duryea's boat is to be named Minga and Mr. Gilbert's Scioto. These boats are 65 ft. over all, 60 ft. on the waterline, 10 ft. 6 in. beam and 3 ft. 6 in. draught. They will cost about \$10,000 each and take five men in each crew. Another small craft at Morris Heights is the Myhishana, a 54-ft. steamer, for M. Goldsmith. This boat will cost about \$8,000 and three men will be required to run her. The steam yacht Levanter is being built for Wilson Marshall. This will be another fast boat, but not as fast as the Niagara or Velthra. Her dimensions are 100 ft. over all, 90 ft. on the water line, 10 ft. beam and 6 ft. 6 in. draught. She will cost \$20,000.

A steam yacht has been built at Baltimore by the Nelson Yacht Building Co. for Richard P. Hart and Henry Burden, 2d, from designs by Tams, Lemoine & Crane. Her general dimensions are 126 ft. 6 in. over all, 110 ft. on the waterline, 20 ft. beam and 6 ft. 6 in. draught. She is to be used cruising about the West Indies. Her plans are novel. She has the bow of a warship and a shade deck extends the whole length of the yacht. The bulwarks at the bow are carried up to the shade deck, and besides making the boat dryer, furnish an upper forecastle for the crew. The owner's quarters consist of one double stateroom and five single ones and bathrooms on the main deck. In the deck house are the captain's and engineer's rooms, the owner's private stateroom, dining saloon, galley and pantry. This boat will carry sufficient coal to enable her to steam 2,000 miles at 7 knots, or 1,300 miles at her best speed, 13 knots an hour. She will cost \$42,000, and it will take twelve men to run her.

J. W. Millard has designed a steamer for T. D. Underwood, president of the Erie railroad, which has been built by the Marine Construction & Dry Dock Co. at Mariners' Harbor, Staten Island. This boat is 135 ft. over all, 116 ft. on the waterline, 17 ft. beam and 9 ft. draught. She will be schooner-rigged and have two smokestacks. The owner's quarters will be forward and the crew will bunk aft. The boat will cost about \$45,000 and will have a crew of twelve men.

Two good sized steamers are being built by Lawley of Boston from designs by A. S. Cheesebrough. The largest is 166 ft. over all, and is for C. A. Fletcher. This boat will cost about \$90,000 and take a crew of fifteen men. The other is for Charles G. Emery, and is to be named Calumet. She is 145 ft. over all, 117 ft. on the waterline, 17 ft. 6 in. beam and 6 ft. 4 in. draught. Her cost will be about \$70,000, and she will have a crew of fourteen men. She is to have a speed of 19 knots an hour.

Evans R. Dick, who recently sold his steamer Elsa, has had another one built by Bayles & Son, from designs by Gardner & Cox. This boat is 108 ft. over all, 97 ft. on the waterline, 18 ft. 9 in. beam and 5 ft. 6 in. draught. She will cost about \$30,000 and have a crew of eleven men.

The Czarina, which has been launched and is now being finished at the Crescent Ship Yard, is 166 ft. over all and 140 ft. on the waterline. She is built for long cruises and will be able to carry 60 tons of coal in her bunkers, which will carry her 3,000 miles at moderate speed. Her best speed will be about 15 knots. She was built by Charles S. Bryan, of New York, and is so strong that if she is ever wanted as a cruiser she can mount two 15-pounders on each broadside, two 6-pounders and four machine guns without being braced or shored. She will be handsomely finished. Her cost will be about \$90,000, and she will have a crew of fourteen men. The owner's quar-

ters on the Czarina are forward, and the crew will be aft. A deck house extends nearly the whole length of the yacht, above which are a promenade and sun deck. In the deck house will be the dining saloon, music or social hall, a large stateroom for the owner, and the captain's and engineer's rooms. The boat will have distilling, refrigerating and electric lighting plants and be up to date in every detail.

Gen. B. M. Whitlock is having a steamer built by the Marine Construction & Dry Dock Co. from designs by Gardner & Cox, which is to be 70 ft. in length and to steam 16 miles an hour. She will cost about \$15,000.

In the last few years yachts with full sail plan and fitted with auxiliary engines have become very popular. The beauty of these boats to some yachtsmen is that when the winds are light or baffling the engines can be started and the yacht will make fair headway, and, if the wind is favorable the yacht can proceed on her journey under sail, and some of these boats have proved to be good sailers. The engines in these vessels do not take up much room, and the coal required is stored way down so that it acts as ballast. The largest of these auxiliaries fitted with steam engines is being built this year for Wilson Marshall of the Larchmont Yacht Club by the Townsend & Downey Ship Building & Repair Co. at Shooter's island. The designs were made by Gardner & Cox, and the general dimensions are 190 ft. over all, 135 ft. on the waterline, 31 ft. beam and 14 ft. draught. She will have a centerboard and be rigged as a three-masted schooner. Her engines are to be of the vertical type, with cylinders 8½, 14 and 22 in. respectively in diameter by 16 in. stroke. The vessel is built of steel, her cost will be about \$125,000, and she will have a crew of eighteen men. She was to have been out early in the season, but the strike of the ship builders has delayed the work, and Mr. Marshall will use the schooner Atlantic, which he still owns, until his new yacht is ready. At the same yard is building a auxiliary for J. M. Masury from designs by A. Cary Smith & Barbey. This is a steel vessel, 120 ft. over all, 90 ft. on the water line, 23 ft. beam and 14 ft. draught. She will cost about \$70,000 and have a crew of ten men. A. C. Bostwick is having a auxiliary built from designs by A. Cary Smith & Barbey by the Harlan & Hollingsworth Co. at Wilmington, which is fast approaching completion. This vessel, also of steel, is 158 ft. 6 in. over all, 120 ft. on the waterline, 27 ft. 6 in. beam and 15 ft. draught. She will cost about \$110,000, and have a crew of eighteen men. Her engines will be of 200 H. P.

Another big auxiliary is the Intrepid, which is being built by Marvel at Newburgh for Lloyd Phoenix from designs by J. Beaver Webb. This boat will be 128 ft. on the waterline, which is a little less than the present Intrepid, and she will cost about \$100,000.

Three houseboats will be seen out this season. One, built by Osborn at Croton for Gen. Louis Fitzgerald, is now in commission and has been cruising in southern waters. She cost about \$30,000, and her dimensions are 100 ft. long, 23 ft. beam and 3 ft. draught. She is fitted with two 25-H. P. motors and has a crew of seven men. E. W. Hooker is having a 130-ft. boat built by Palmer. She is 30 ft. beam and draws 6 ft. 6 in. She will cost about \$35,000 and have a crew of eight men. Geo. C. Thomas is having one built by the Wilson Yacht Building Co. at Baltimore. This boat is 110 ft. over all, 90 ft. on the waterline, 24 ft. beam and 6 ft. 6 in. draught. She will cost about \$24,000, and have a crew of six men.

There will be a large fleet of power boats, ranging in size from the 12-ft. yacht tender to boats 100-ft. long. In these boats the motor power is gasoline, naphtha or electricity, and electric launches are becoming very popular. The Gas Engine & Power Co. at Morris Heights has built an auxiliary yacht 57 ft. over all and 41 ft. on the water line for J. H. Smedley of Detroit. This boat will have a 14-H.P. motor and will cost about \$6,500. A 40-ft. mahogany launch has been built for Walter Jennings, a 35-ft. cruising cabin launch for Charles M. Morgan, two 30-ft. hunting launches for John W. Gates, a 30-ft. naphtha launch for Gen. J. A. Johnson, a 30-ft. launch for the United States engineers' office, a 21-ft. launch for W. J. Gamble of Seabreeze, Fla., two 24-ft. yacht tenders for W. R. Nelson of Kansas City, a 45-ft. launch for V. M. Beolchi of New York, which has been named Rosemary, a 30-ft. cabin boat for Charles W. Whitney of Boston, a 25-ft. cabin boat for T. H. Meyers, a 36-ft. cabin launch for A. E. Wells of Chicago, an auxiliary launch for George Poppert, a 25-ft. launch for Mrs. Foster Coates, a 25-ft. launch for Kyrle Bellew, as well as many yacht tenders. The cost of all these boats will be about \$50,000.

Gardner & Cox have designed three power boats that are expected to be fast. A twin-screw boat is being built at the Marine Construction & Dry Dock Co.'s works at Mariners' Harbor for George W. Childs Drexel. This boat is 64-ft. over all, 56 ft. on the waterline, 11 ft. beam. She will have two 20-H. P. motors, and her cost will be about \$8,000. Two are being built by Ayres & Son at Nyack. One, a boat 91 ft. over all, 75 ft. on the waterline, 14 ft. beam, is for Macomb G. Foster, and will cost about \$8,500. The other is for John H. Hanan and is 114 ft. over all, 103 ft. 8 in. on the waterline, 15 ft. beam and 5 ft. draught. She will cost about \$10,000.

Several boats are being turned out at the Electric Launch Co.'s works at Bayonne. The most important are cruising boats

and high-speed launches. Several of these have been designed by H. J. Gielow, and two are from designs by C. F. Herreshoff. A 65-ft. high-speed gasoline yacht has been built for F. C. Havens, which will be equipped with a 70-H. P. motor. This boat will have accommodations for four guests and the crew, and she will cost about \$8,000. W. F. Morgan has ordered a 60-ft. high-speed gasoline yacht, which will be fitted with a trunk cabin and have accommodations for six and two in the crew. This boat will have two 25-H. P. motors and will cost \$8,000. A 60-ft. auxiliary yawl for R. Waverly Smith has been named Nauhaka. She is a very roomy boat, and has an electric lighting plant on board. She is driven by a gasoline engine and made 7½ miles an hour on her trial. She cost \$6,500. Charles H. Davis, who has one of the 25-ft. one-design class of sloops, is having a 52-ft. high-speed launch built from C. F. Herreshoff's designs at Bayonne. She will have two 30-H. P. motors, and her speed is to be 20 miles an hour. This boat will cost about \$5,000. A launch for C. Oliver Iselin, 32 ft. on the waterline which has shown a speed of 13 miles an hour, cost about \$1,800. The Electric Launch Co. has also built a 36-ft. gasoline launch for a well-known New Yorker, a 48-ft. cruising launch for John Hays Hammond and electric launches for A. J. Cassatt, Adolph Lewisohn, Robert Hartshorn, F. M. Smith, George Bullen, Charles Garrow, R. D. Douglas, and the Lighthouse board. These boats will cost about \$24,000. The Whitestone Hollow Spar Co. is turning out two 70-ft. launches which are expected to be fast. They are for George R. Bidwell and J. Charles Davis, and their cost will be about \$6,000 each.

The largest sailing craft with gasoline for motor power is the schooner being built by Small Bros. for W. Amory Gardner. This yacht is to be schooner rigged and her dimensions are 125 ft. over all, 85 ft. on the waterline, 24 ft. beam and 12 ft. draught. She will have a centerboard and a 40-H. P. motor. Her cost will be \$40,000 and she will have a crew of ten men.

B. B. Crowninshield has designed and Lawley is building a schooner for Laurence Jones which will be fitted with a 25-H. P. motor. This boat is 83 ft. over all, 55 ft. on the waterline, 20 ft. beam and 3 ft. draught without the centerboard. She is for use in southern waters and will cost about \$10,000. Lawley has built a yawl, which has been named Vagabond, for C. D. Gibson of New York. This boat is 50 ft. on the waterline, has a gasoline engine, and cost about \$9,000. J. P. Elton has had a 50-ft. yawl with auxiliary engines built by Lawley at a cost of about \$7,500.

Charles G. Davis has designed a 27-ft. water line yawl for Dr. Schofield, which is being built at Hanson's City island, and a similar boat for Charles A. Hatch. These will have 12-H. P. motors and will cost about \$2,500 each. Arthur Binney has designed and Lawley is building a 60-ft. auxiliary schooner for C. H. H. Clark to be fitted with an auxiliary motor, and she will cost about \$20,000 and have a crew of eight men.

The fleet of small boats will be very large. Small Bros. are turning out a 26-ft. hunting launch for I. S. Carpenter, a 21-ft. auxiliary cruiser for E. A. Chadwick of Lynn, a 29-ft. cabin launch for a Boston yachtsman, a 25-ft. auxiliary yawl for W. Moseley Swain of Philadelphia, 30-ft. hunting launch for F. C. Plaisted of Bangor and a 28-ft. speed launch for G. T. Speery of Springfield. These will cost about \$12,000. W. B. Stearns is building a 25-ft. speed launch for E. T. Bigelow of Medford and ten yacht tenders in addition to the yawl for Mr. Elton. These will cost about \$11,000. Dr. Charlton is having a 35-ft. auxiliary yawl built at Newport from designs by Hand. The cost is \$4,000.

Charles D. Mower has designed several launches which are being built in different yards. One is a 32-ft. yawl for Vice-Commodore Lee of the Manhasset Bay Club and is being built by Huntington. There are four other launches, in sizes varying from 25 to 39 ft., and these will mean an outlay of \$6,500. Lawley, in addition to the boats already mentioned, has a 35-ft. launch for the Boston Yacht Club, a 42-ft. launch for a Philadelphia yachtsman, a 27-ft. launch for C. C. Clapp and launches for J. H. Proctor and W. F. Greer. These will cost \$8,000.

The Greenport Construction Co. has a 33-ft. launch for Dr. H. W. Green of Springfield, to cost about \$1,500. Isaac B. Mills has designed 30-ft. launches for J. E. Eustis and Fred. S. Smith, a 27-ft. launch for Sydney M. Hedges, a 35-ft. cabin launch for G. H. Street and a 30-ft. hunting launch for C. T. Esterbrook. They will cost about \$9,700.

Assuredly life aboard an American warship is more fatal in time of peace than in time of war. During the Spanish-American war with the two decisive battles at Manila and Santiago only one man was killed, but explosions at the breach during gun practice have carried off many since. Last week a disastrous explosion occurred on the battleship Iowa while at gun practice in the gulf. The forward port gun burst from the premature explosion of a shell, 12 ft. of the piece outside the turret being demolished. Three men were killed and five injured, two seriously.

Workmen at the William A. Boole ship yard, San Francisco, decided last week to work more than eight hours a day on a government job. The point was conceded to them.

## STEEL CORPORATION'S ANNUAL REPORT.

Aside from the financial statement, there are many facts of interest in the annual report of United States Steel Corporation. An unfavorable feature of the statement is the small surplus reported, amounting to only \$2,978,245, assuredly a very small amount when one considers the aggregate capital of the company. It is certainly surprising that the company should distribute \$5,000,000 in dividends upon common stock when its surplus is so low. Indeed had the earnings for the quarter decreased \$3,000,000 the corporation would have had to declare a deficit. The gross sales and earnings for the year were \$560,510,479.39, and the manufacturing and operating expenses were \$411,408,818.36. Miscellaneous expenses amounted to \$3,128,970.71, making the total net operating income \$152,230,631.74. General expenses and interest charges reduced the net earnings to \$133,308,763.72. The production of the several properties for the year 1902 was as follows:

|  | Tons.          |
|--|----------------|
| Iron ore mined, Marquette range                    | 1,487,370      |
| Iron ore mined, Menominee range                    | 2,675,754      |
| Iron ore mined, Gogebic range                      | 2,064,492      |
| Iron ore mined, Vermillion range                   | 2,057,537      |
| Iron ore mined, Mesabi range                       | 7,778,026      |
| <br>Total  | <br>16,063,179 |
| Coke manufactured                                  | 9,521,567      |
| Coal mined, not including that used in making coke | 709,367        |
| Production of pig iron                             | 7,802,812      |
| Production of Spiegel                              | 128,265        |
| Production of ferro-manganese and silicon          | 44,453         |
| <br>Total  | <br>1,975,530  |
| Production of Bessemer ingots                      | 6,759,210      |
| Production of open-hearth ingots                   | 2,984,708      |
| <br>Total  | <br>9,743,918  |

The tonnage of unfilled orders on the books at the close of 1902 equaled 5,347,253 tons of all kinds of manufactured products. At the corresponding date in the proceeding year the orders booked equaled 4,497,749 tons. In many of the classes of heavier products, like rails, plates and structural material, practically the entire capacity of the mills is sold up until nearly the end of the year 1903.

The expenditures made during the year by all the properties and charged to property account equal, less credits for property sold, the total sum of \$16,586,531.77. These outlays were made for the completion of construction work at manufacturing properties under way when the United States Steel Corporation was formed, also for necessary additions and extensions authorized since its organization, for the acquirement of additional ore and coal property, the opening and development of new mines and plants, for additional equipment and facilities demanded by the growing requirements of the business of the transportation properties, to secure material reduction in cost of manufacture, transportation of raw and unfinished materials and distribution of finished products. The outlays as above are classified by properties as follows:

|  |                     |
|--|---------------------|
| United States Steel Corporation on account of acquirement of stock of subsidiary companies | \$ 258,473.31       |
| Manufacturing properties   | 9,743,125.78        |
| Ore properties   | 1,971,542.08        |
| Coal and coke properties   | 2,043,168.61        |
| Transportation properties  | 2,741,652.51        |
| Miscellaneous properties   | 171,430.52          |
| <br>Total  | <br>\$16,586,531.77 |

The average number of employees in the service of all properties during the entire year was 168,127, classified as follows: Manufacturing properties, 123,326; coal and coke properties, 16,519; iron mining properties, 13,465; transportation properties, 11,160; miscellaneous properties, 1,657. The sum paid out during the year for salaries and wages was \$120,528,343. The corporation has 31,799 preferred stockholders and 26,830 common stockholders.

## BUILDING HEAVY ANCHORS.

An order has just been received at the Charlestown navy yard directing the equipment department to manufacture sixteen anchors to weigh 17,600 lbs. each—the largest ever put on any warship or merchant steamer afloat or building. The order states that the anchors are to be used on board the recently-authorized battleships Tennessee, Washington, Connecticut and Louisiana. As soon as work is begun a larger force of men will have to be employed to operate the forges and hammers and as helpers. At present about 150 men are engaged in the manufacture of anchors and chains in the old shops but within a short time the new shops will be completed and new machinery installed, thereby trebling the capacity of the plant. Each of the four new battleships will be given four of the great anchors

and four chains or cables, as they are termed in the navy. These chains will be very heavy, although not quite equal to those carried by the largest of the ocean liners. Every chain used on a United States warship comes from the yard at Charlestown, and before they are sent out each is thoroughly tested. For instance, the chains for the great 17,600-lb. anchors must withstand a breaking strain of at least 404,000 lbs. Out of every 90 ft. of chain at least one link is broken in the testing machine. The test never fails to show that the links are stronger by at least 25,000 lbs. than the requirements demand, and sometimes they exceed it by more than 30,000 or 35,000 lbs.

Besides the order for the 17,600-lb. anchors, the equipment department also has on hand orders for fifteen more to weigh 16,500 lbs., as well as scores of smaller sizes weighing from 8,000 down to 30 lbs. Those ranging from 30 to 120 are for the launches and small boats; those from 300 to 1,000 for torpedo boats and those from 1,000 to 5,000 for gunboats. The larger sizes go to the protected cruisers, armored cruisers and battleships of different classes.

At the lower end of the navy yard reservation there is a large vacant lot which is known as the "anchor park." Very few of the numerous visitors to the yard ever see this collection of antique and modern appliances for anchoring ships. But the exhibit is well worth viewing. Among the 300 specimens displayed are representatives of every type ever used in the navy, with possibly the exception of the earliest variety of frigate anchors. Some of them are nearly 100 years old, and scores of different patterns are shown. In the collection are many "freak anchors," of which only a single specimen exists. These were invented by someone who had enough influence to get the navy department to authorize the trial of a sample on some ship. Few ever proved of any practical value. Only a few days ago thirty anchors arrived at the park from San Francisco.

## THE LOBSTER.

Whatever of truth there may be in the remark of that little girl who, when cautioned by her mother against eating lobster, said that "everything nice and worth having in this world appeared to be either wicked or indigestible," it is the opinion of the most fastidious of epicures that lobster meat is good to eat; and for an eatable that appeals to all palates, even if not answering the requirements of all stomachs, there shall ever be a ready market. Being of a low order of intelligence, this delectable inhabitant of the sea is certainly not guilty of race suicide, yet it is a well-known fact that notwithstanding the government's protective measures the crop of crustaceans is yearly decreasing.

Though the wholesale dealers buy only those that have attained a length of 10 in. and over, the greed of the toilers of the deep who make it their business to entrap the unwary lobster is responsible for the unlawful slaughter of the "shorts," and they dispose of the latter to outsiders who are unacquainted with the rules and regulations regarding the sale of lobsters. While the law also requires that a female lobster with eggs shall be returned to its home, and fines heavily anyone convicted of offering a prospective mother for sale, it is a common occurrence for the fisherman to scrape off the eggs, thus destroying hundreds of embryo lobsters for the sake of a paltry sum. The majority of dealers keep their stock in submerged cars, and as a lobster that has been robbed of the joys of motherhood attacks any and all of its kind within reach, the wholesale slaughter taking place in a car, should an outraged female be among the prisoners, can readily be imagined.

Incidentally it may be well to mention here that officers of the society with the long name condemn the practice of boiling lobsters alive as unnecessary cruelty, and though it is difficult to devise a scheme for the painless cooking of those creatures, the tender hearted housekeeper may be pleased to be told that the scientists, without altogether denying that lobsters are sentient beings, positively affirm that their capacity for feeling physical pain is abnormally small.

The bait that lures the lobster to its doom in the trap may consist of sculpins, cod's head, or porgies, but while the two first named answer the purpose with any lobster whose rambles bring it within sight of the trap, the grease of the porgies, when sufficiently antique, borne by the tide, shows a road that the least hungry lobster cannot resist to travel. Their crawling being done mostly by night, the fisherman inspects his traps each morning, when, after rebaiting, they are again consigned to the deep for 24 hours. Each trap with its ballast weighs about 15 lbs., and after hauling, clearing, rebaiting, and lowering 300 of such, the lobsterman is often compelled to row or scull home should lack of wind make his sail useless.

The dealers generally sell by weight, but whatever may be the price that the consumer has to pay for this table delicacy, the fishermen along the coast only receive 15 cents for each lobster not under 10 in., and if willing to run the risk of being fined they may sell the so-called "shorts" to summer residents, or give them to tug boats cooks in exchange for a tow home.

F. H.

Rear Admiral Bowles is endeavoring to introduce the piece-work system at the New York navy yard. He hopes by that means to make better progress upon the battleship Connecticut.

## NEWS OF THE



## GREAT LAKES

## THE OPENING ON THE LAKES.

The strike of firemen has caused greater delay than was expected in the movement of vessels on the lakes, but there is still a large part of the fleet, notably the Gilchrist and Mitchell vessels, that have done practically nothing towards fitting out. The season will therefore be somewhat shorter than in 1902, even with the settlement this week of the trouble with the firemen, which is expected. The firemen have not had good cause for refusing to work, in view of the contracts made with other men aboard the vessels and the rioting and assaults upon non-union men during the present week must result to their disadvantage. While the vessels are delayed in starting, railroads between Ohio ports and the blast furnaces are using their full equipment in partly relieving the docks of their great stocks of ore. There is therefore no great loss in freight movement, as every foot of space provided by moving ore from the Lake Erie docks means so much gained a little later on. No freight contracts of any kind are reported in either coal or ore. Some single-trip charters for coal to the head of Lake Superior have been made at 40 cents and that is all that has been done in freights aside from an occasional grain charter at Chicago at  $1\frac{3}{4}$  to 2 cents on corn to Buffalo.

## NOTES FROM THE HEAD OF THE LAKES.

Duluth, Minn., April 15.—About 5,000,000 bu. of flaxseed is in store at Duluth-Superior. This is more than was ever accumulated in one place in the history of the trade. Most of it is sold. About 2,000,000 is expected to go forward at once. Of this flax a very large share is in the Peavey concrete storage in Duluth, where there is no insurance to pay, making a considerable difference in a commodity worth more than \$1 a bushel. The American Linseed Co. owns most of it.

Flour mills at the head of the lakes are running very slowly, on account of the poor market. At Minneapolis there are some 175,000 bbls. of flour in store awaiting shipment to Buffalo.

All saw mills around Lake Superior that run summers are starting this week and will be in full swing in a few days. Winter mills are shutting down for a few days for overhauling and repairs. They have now on dock the largest accumulation of partially dry stock ever known at the opening of navigation, and practically all of it is sold for eastern delivery. The winter has been a good one for logging and mills have full supplies of logs for the season.

There is some copper piling up at Portage lake awaiting shipment by lake but the railroads have kept the smelters dry all winter. It is stated that the amount now on hand, 3,000 tons, is less than at the corresponding period at any time since the copper industry became a large one in the lake region. Smelters are now turning out more metal than ever in their history, about 325 tons daily. The March product was in the neighborhood of 9,000 tons, forestalling a production for the year of about 200,000,000 lbs., the largest on record. Nearly two-thirds of the copper now on hand is at the Calumet & Hecla works at Lake Linden. New mines this year are the Baltic, Champion, Adventure and Winona, while a few others are so nearly new that they really count now for the first time as considerable producers. The Champion has 1,000,000 lbs. on hand waiting shipment.

Mr. T. F. Cole, head of the Steel Corporation's mines, has been elected a director of the Northern Power Co., the organization that is to develop water power from the St. Louis river here. The company has a very strong board of directors, including A. B. Wolvin, Alex. McDougall, C. A. Duncan, T. F. Cole, C. C. Coker, F. A. Patrick, A. M. Marshall, F. A. Coker, D. A. Reed, G. M. Rittenhouse. Work will begin as soon as the frost is out of the ground and materials can be assembled.

The tug Morse, belonging to Chas. Heard & Sons, Pequaming, Lake Superior, has been rebuilt the past winter at a cost of \$6,000. The tug Nellie Cotton, long the property of Peyton, Kimball & Barber, Duluth, lumber dealers, has been sold to Houghton parties for \$4,000. She will go there at once. The Cotton is an iron hull and quite old. The tug Tom Dowling, of the Independent Tug Line, Duluth, was sunk by ice in the harbor last week, but has been raised and is being recalked at the Grignon dry dock.

Capt. W. H. Littleton, at one time one of the best known tug men on the great lakes, is dead at Clayton, Mich. In the early 70s he was master of the Champion and other tugs, besides owning interests in a couple of vessels of the lake tug kind.

## STEAMER CUMBERLAND AT FAULT.

Judge Wing of the United States district court, Cleveland, has just rendered an opinion attributing the fault for collision that occurred on Lake St. Clair to the steamer Cumberland. The steamer Aurania, owned by John Corrigan of Cleveland, and the barge Pennington, tow of the steamer Spencer, suffered damages on account of the fault attributed to the Cumberland, and the Cumberland is held for the damages to both vessels. The Tonawanda Iron & Steel Co., owners of the Pennington, joined with John Corrigan, owner of the Aurania, in libel proceedings against the Cumberland and by stipulation the cases were tried together. The opinion of the court is as follows:

"All the vessels involved in these collisions were bound down, and were about 2 or 3 miles from the lightship off Grosse point, at the foot of Lake St. Clair. The steamer Spencer, with her tow, the Pennington, was in the lead. The steamer Aurania was passing the Pennington and had lapped the latter to about amidships, and was distant to port of the Pennington about 300 ft. According to the testimony of the Cumberland, this distance might have been as great as 600 ft. The Cumberland was coming down at a greater rate of speed than either of the other vessels, and attempted to go between the Pennington and the Aurania. A collision between the Cumberland and the Pennington took place, the bow of the former striking the port quarter of the latter. The Pennington immediately took a sheer to port, breaking her tow line, and struck the Aurania. The claim of the several libelants is that all this was the fault of the Cumberland. The claim of the Cumberland is that she was crowded into a position near the Pennington by the improper steering to starboard of the Aurania; but that such crowding did not occasion her to go so near the Pennington as to necessitate a collision, except for the undue sheering to port of the Pennington. The proof from the Spencer, the Pennington, and the Aurania is clear to the effect that the Pennington made no sheer until struck by the Cumberland.

"By the theory of the Cumberland, we must assume that, by sheering before being struck by the Cumberland, the Pennington broke her tow line. The evidence is that the tow line was of ordinary strength. There was little, if any, current, and the vessels were going with the current, whatever it may have been. It seems an impossible thing for a tow, running with the current, to break a tow line by bad steering. The testimony from the deck of the Pennington is that the tow line broke immediately after the Pennington was struck by the Cumberland. This seems an entirely reasonable way of accounting for this occurrence. The Cumberland was the overtaking vessel and upon it rested the duty of keeping out of the way.

"The evidence points, as an explanation of this disaster, to this theory: That the Cumberland miscalculated the distance separating the Pennington and the Aurania, and at first thought there would be ample room for her to pass between. Having partially accomplished this passing, she found that there would be too much danger involved, and checked, stopped and backed. These maneuvers interfered with her steering and threw her stern to port, which resulted in a swinging of her starboard bow onto the port quarter of the Pennington. This gave the Pennington a sheer to port, breaking her tow line and sending her into the Aurania.

The fault of both collisions was with the Cumberland, and the causes are referred to H. F. Carleton as commissioner to assess the damages inflicted upon the Pennington by the Cumberland and also the damages inflicted upon the Aurania by the Pennington. The petition of the Cumberland to have the liability fixed upon the Pennington and upon the Aurania is dismissed."

## OFFICERS OF LAKE VESSELS

Gilchrist Transportation Co., J. C. Gilchrist, Mgr., Cleveland: Steamers—City of Genoa, Capt. Alex. Clark, Engineer Wm. Brake; City of Naples, Capt. J. W. Bay, Engineer R. D. Mayberry; City of Rome, Capt. Benson Fox, Engineer T. F. Higgins; Columbia, Capt. A. A. Williams, Engineer David L. Brown; Colonial, Capt. Nelson Brown, Engineer G. C. Risch; John Craig, Capt. W. Murphy, Engineer Peter Mullen; Cumberland, Capt. Albert Swanson, Engineer A. L. Hatch; C. A. Eddy, Capt. F. A. Dupree, Engineer Stewart Brant; C. W. Elphicke, Capt. J. A. Nicholson, Engineer Chas. Shapp; Gilchrist (steel), Capt. J. P. Minskey, Engineer C. N. Albee; J. C. Gilchrist, Capt. J. A. McDonald, Engineer W. N. Eddy; John Harper, Capt. Ed. Mooney, Engineer H. J. Hawthorne; F. W. Hart, Capt. Ben Moshier, Engineer John Fritz; Helena, Capt. Frank Powell, En-

gineer Peter Shackett; Hiawatha, Capt. D. Buie, Engineer D. M. Foster; Jupiter, Capt. C. M. Ennes, Engineer C. J. Erickson; Lake Shore, Capt. Chas. Hahn, Engineer Henry Jesson; Lansing, Capt. Geo. Welcome, Engineer E. Harris; Maytham, Capt. E. D. Chilson, Engineer A. McLaren; Manhattan, Capt. J. B. Lyons, Engineer W. H. Pinkham; Marquette, Capt. Chas. Caughell, Engineer Harry Parker; Mars, Capt. R. J. Walder, Engineer John Seymour; Massachusetts, Capt. Geo. Phillips, Engineer H. W. Barden; Mecosta, Capt. T. J. Carney, Engineer J. C. Gray; Merida, Capt. A. C. May, Engineer B. Beauchamp; Merrimac, Capt. Frank Ott, Engineer F. Oullette; Neosho, Capt. Peter Full, Engineer Harry Potter; Neptune, Capt. F. H. Reed, Engineer Jno. Parks; Neshoto, Capt. Stanton Markle, Engineer G. Rogers; Nimick, Capt. W. G. Rogers, Engineer T. F. Birch; E. W. Oglebay, Capt. W. C. Butts, Engineer T. A. Francombe; Olympia, Capt. S. E. Philp, Engineer Peter Lamaar; F. M. Osborne, Capt. M. H. Clark, Engineer Clam Clark; A. A. Parker, Capt. Geo. S. White, Engineer R. B. Butler; R. R. Rhodes, Capt. ——, Engineer H. Christenson; Saturn, Capt. A. M. Shepard, Engineer Jos. Birney; Saunders, Capt. E. L. Ennes, Engineer Henry Mitchell; R. E. Schuck, Capt. F. Hasenflue, Engineer R. H. Reynolds; Sitka, Capt. W. W. Landgraf, Engineer W. T. Schwacofer; Siberia, Capt. W. A. Ashley, Engineer F. O. Burrows; V. Swain, Capt. B. J. Lyons, Engineer D. Conway; Steel King, Capt. F. A. Goodell, Engineer Jas. Balfour; Tacoma, Capt. Pierre Bouille, Engineer T. J. Flower; C. Tower, Capt. T. Moore, Engineer Geo. Moore; Tyrone Capt. Edward Lohr, Engineer Geo. Riggan; Uranus, Capt. Thos. Gibson, Engineer A. F. Hogle; Vulcan, Capt. Geo. Grasser, Engineer Geo. Froggett; Vega, Capt. W. F. Delaney, Engineer T. Herring; Venus, Capt. H. G. Hayberger, Engineer Chas. Gumlich; Volunteer, Capt. G. L. Guddeback, Engineer Luke J. Manion; Wallula, Capt. M. J. Madden, Engineer John Conley; C. W. Watson, Capt. W. H. Blattner, Engineer John Maher; Waverly, Capt. H. Bennett, Engineer Chas. Martin; D. C. Whitney, Capt. D. B. Elsey, Engineer Wm. Beamer; D. M. Whitney, Capt. Chas. Hinslea, Engineer Chas. A. Francombe; Geo. F. Williams, Capt. Wilson McGregor, Engineer Thomas Burns; A. P. Wright, Capt. C. H. Heaton, Engineer P. C. Mayer; Yakima, Capt. D. C. Girardin, Engineer John Smith. Schooners—Antrim, Capt. F. E. Johnson; M. S. Bacon, Capt. A. A. Munroe; W. S. Crosthwaite, Capt. Mathew Ross; F. A. Georger, Capt. John Mason; Magnetic, Capt. J. S. Jones; Moonlight, Capt. D. E. Campbell; B. W. Parker, Capt. Geo. Richards; Angus Smith, Capt. F. H. Lennon; Twin Sisters, Capt. Jas. Kobel; Verona, Capt. Wm. Ziem; Yukon, Capt. Louis Bangs.

Union Transit Co., Buffalo: Steamers—J. M. Nicol, Capt. Wm. McLean, Engineer Geo. W. Haig; Eber B. Ward, Capt. John I. McIntosh, Engineer Jas. Countryman; Portage, Capt. John Tyrney, Engineer Ed. Oag; Rochester, Capt. P. O'Neil, Engineer N. Johnson; New York, Capt. N. McGuire, Engineer John Caul.

Hawgood, H. A., Cleveland: Steamers—Etruria, Capt. T. C. Ellis, Engineer Robt. Buchanan; H. B. Hawgood, Capt. Geo. E. Robarge, Engineer —— Roswell; S. S. Curry, Capt. C. H. Saph, Engineer Geo. Smith.

Pickands, Mather & Co., (Managers for Huron Barge Co.), Cleveland: Steamer—Pathfinder, Capt. D. H. Malloy, Engineer C. A. Heisner.

Pickands, Mather & Co., (Managers for Boston Coal Dock & Wharf Co.), Cleveland: Steamer—Appomattox, Capt. H. Stevenson, Engineer A. A. Manion. Schooner—Santiago, Capt. F. Hebner.

Pickands, Mather & Co., (Managers for Interlake Co.), Cleveland: Steamers—Kearsarge, Capt. Robt. McDowell, Engineer ——; Victory, Capt. Geo. B. Mallory, Engineer A. Arnold. Schooner—Constitution, Capt. Harry Howard.

#### CANADIAN TRANSPORTATION COMMISSION.

Kingston, Ont., April 15.—The transportation commission appointed by the Dominion government to inquire into the system of Canada's channels of transportation—rail, lake, river and canal—will have very wide powers and its report will be an important one. The members of the commission are Sir Wm. Van Horne, chairman of the board, Canadian Pacific Ry.; John Bertram of the Bertram Engine Works, Toronto, and J. H. Kennedy, freight agent, Quebec. While the commission is a satisfactory one from many points of view, it would have been much more so if it had included someone from the west representing the grain shippers. The transportation problem in Canada would not need a commission to solve it if it were not for the fact that for about five months in the year there is only one route from Manitoba, through Canada, to the point of export—1,000 miles of it through a territory in which no traffic whatever originates. The projected railways will remedy this state of affairs in the course of time, and the commission will probably say but little on this aspect of the question, but will likely make some strong representations upon the question of improving the waterways. For years past the Dominion government has been spending money tinkering away at harbors at a number of different points on the great lakes without making any of them satisfactory to shippers. Every port has been fancying that it was in-

tended to be another Buffalo and its friends have put forward every effort to obtain aid from parliament to deepen the entrance to the harbor or to construct wharves. If sufficient money had been voted in each case to complete the work it would have been satisfactory but the amount provided was never sufficient to do more than a little. The ex-minister of public works, Mr. J. I. Tarte, endeavored to initiate a different order of carrying out these works but was only partially successful. His idea was to assume that the present 14-ft. depth of the canal waterways was final and that if additional waterways were required they must be looked for in another direction, namely, by the French river, Lake Nipissing and into the Ottawa river. Further he advocated the selection of a few ports on Georgian bay, which had good rail facilities, where the harbors were to be completed so that the largest upper-lake steamers could be accommodated, and that Fort William and Port Arthur on Lake Superior were also to be made first-class ports in every respect. The question in Canada is whether the commercial requirements of the country will be permitted to outweigh the present necessities of political partisans. The business men in parliament would be glad of an opportunity to break away from political needs to do what is necessary for the country, and perhaps a strong report from this commission will give them the necessary spur to avow their convictions.

#### CANADIAN SHIPPING NOTES

British-built bottoms suitable for Canadian trade on the great lakes are reported by those who have recently visited England to make purchases to be exceedingly scarce. Several purchases have been made but there are few modern steamers of Welland canal size offering. Capt. Bassett, among others, advises Canadian vessel men who wish to add to their fleet, to place orders for the vessels with ship builders on the great lakes in view of this scarcity of British bottoms.

The steamer Manitou, just completed at Marlton's yard, Goderich, Ont., for the Dominion Fish Co., is of the following dimensions: Length over all, 140 ft.; beam, 24 ft.; depth, 10 ft. 7 in.; tonnage, gross 470, net 297. She is licensed to carry 200 passengers. The engines were constructed by the Goderich Engine Co., and will give the vessel a speed of 12 miles an hour. The Manitou will trade on Georgian bay.

The Western Steamship Co., of which Capt. Bassett, late of the Northern Navigation Co., is one of the principal shareholders, has purchased the steamer Wexford in London and will bring her out to trade on the upper lakes with Collingwood as her home port. The Wexford is a steel screw steamer and was built by William Duxford & Sons of Sunderland, Eng., in 1883. Her dimensions are: Length, 250 ft.; beam, 40 ft.; depth, 16 ft. 2 in.; tonnage, gross 2,077, net 1,354.

The Polson Iron Works, Toronto, has keels laid for the two lightships for the Dominion government, has under construction in a large shed, two yachts of the torpedo destroyer type, each 70 ft. long by 10 ft. beam, and is laying the keel for a steel tug 66 ft. long by 12 ft. beam, to be fitted with Scotch boiler and triple-expansion engines. Two large steamers have also been undergoing repairs at these works.

A steamer purchased by M. Connolly, for the Baie des Chateurs trade has hitherto been engaged in passenger and freight trade between Glasgow, Scotland, and Belfast, Ireland, and was owned by G. & J. Burns, who are largely interested in the Cunard Line. She is 219 ft. long, 31 ft. 6 in. beam, and has a deadweight capacity of about 1,000 tons. Her speed is about 13 knots, and she is expected to reach Dalhousie, Que., by the end of April.

The Hamilton & Montreal Navigation Co., has been incorporated under the Ontario companies act, with a capital of \$75,000, to carry on a general navigation business. The provisional directors are R. O. Mackay, A. B. Mackay, J. W. Nesbitt, K. C. and J. G. Gould of Hamilton, Ont. The company has been formed for the purpose of operating the screw steamer Lake Michigan, one of the vessels in the Merchants Line.

The Provincial Wrecking Co., Ltd., has been incorporated under the Dominion companies' act with a capital of \$20,000, to carry on, from Barrington Passage, Nova Scotia, the business of salvage and wrecking. W. W. Wilson of Barrington Passage, R. B. Penney, J. E. Nickerson and M. G. Nickerson of Clark's Harbor, and W. A. Killam of Yarmouth are the provisional directors.

The steamer Princess Victoria, which has just reached Vancouver, B. C., from Scotland, is having her upperworks completed there, prior to being placed on the service between Victoria and Vancouver. The steamer is calculated to make 20 knots with favorable conditions, without forced draft, and did make 18.5 knots on her trial, notwithstanding a choppy sea and half a gale of wind.

A branch of the Canadian Association of Masters and Mates has been formed at St. Catherines, Ont., with Capt. A. McNaugh as president and Capt. W. D. Graham as secretary-treasurer. The branch started with fifty-two members and is the fifth branch organized since the beginning of the year.

## COMMERCE OF LAKE SUPERIOR.

**Mile-ton Report of the Sault Ste. Marie Canals is of Absorbing Interest—35,961,146 Net Tons were Moved Through the Canals During the Season of 1902, the Carrying Charges Aggregating \$26,566,189.40 and the Cost per ton per mile Eighty-nine Hundreths of a Mill.**

It has been said frequently in these columns that there is no adequate measure of the port-to-port commerce of the great lakes, and therefore no way of determining the total commerce of the great chain of waters. However, it is fair to assume that more than half the commerce of the lakes passes through the canals at Sault Ste. Marie and it is fortunate, indeed, that records at this point are very reliably kept by the officials in charge of the United States and Canadian canals. Gen. Supt. Joseph Ripley has just submitted to Maj. W. H. Bixby for transmission to the secretary of war the exhaustive report of canal commerce for 1902 that is known as the mile-ton report. The report shows that \$26,566,189.40 was paid as carrying charges to vessels that moved 35,961,146 net tons of freight through the canals in 1902, and that the total value of the freight was \$358,306,300. The cost per ton per mile of moving this freight was eighty-nine hundredths of a mill, against ninety-nine hundredths of a mill in 1901 and 1.18 mills in 1900. The high rate in 1900 was influenced by the fact that season contracts for moving a great part of the ore were made at \$1.25 a ton.

The total freight traffic of 35,961,146 net tons is the maximum traffic in the history of the canals. It exceeds the traffic of the preceding year by 7,558,081 tons, or 27 per cent.; such yearly gain being the largest yet known in amount, although not in percentage, and being 3,536,935 tons more than the previous largest yearly increase of 4,021,146 tons in 1899, and 12 per cent. less than the 39 per cent. yearly increase in 1886. The increased tonnage was general for all the principal items of freight, with the exception of hard coal, manufactured iron, salt and building stone. The total number of passengers was 59,377, a decrease of 286 from the season of 1901. The season of navigation was the largest on record and continued for a period of 8 months and 20 days, during which time the average monthly traffic was 4,149,363 tons.

The American canal passed 31,232,795 net tons of freight, being a yearly increase of 5,650,757 tons, or 22 per cent.; and passengers 22,778, a yearly decrease of 6,923, or 23 per cent. as compared with the season of 1901. The American canal passed 87 per cent. of the total freight and 38 per cent. of the total number of passengers. The American canal opened April 5 and closed Dec. 16, 1902, making the length of season 256 days.

The Canadian canal passed 4,728,351 net tons of freight, being a yearly increase of 1,907,324 tons, or 68 per cent.; and 36,599 passengers, a yearly increase of 6,637, or 22 per cent. as compared with season of 1901. This canal passed 13 per cent. of the total freight and 62 per cent. of the total number of passengers. It opened April 1 and closed Dec. 20, making the length of its season 264 days.

Of the total freight passing through both canals, 96 per cent. was carried in American vessels and 4 per cent. in Canadian vessels.

Vessel passages through both canals numbered 22,659, showing a yearly gain of 2,618 passages, or 13 per cent., as compared with the 20,041 passages of 1901. The lockages numbered 12,846, showing a yearly gain of 1,525 lockages, or 13 per cent.

The forty-five new vessels put into commission for the Lake Superior trade were large steam freighters, varying from 225 to 436 ft. in length and designed for economical speed of 13 miles per hour on a draught of 19 to 21 ft.

The growth of Lake Superior commerce during the past half century has been phenomenal. The estimated amount and value of articles which crossed the portage at Sault Ste. Marie in 1851 to and from Lake Superior was 12,600 net tons, valued at \$1,675,000; in 1861, a decade later, the traffic through the state locks was 88,000 net tons, valued at \$6,000,000; in 1871, 585,000 net tons, valued at \$13,000,000; in 1881, through the state and Weitzel locks, 1,567,741 net tons, valued at \$30,000,000; in 1891, through Weitzel lock, 8,888,759 net tons valued at \$128,178,208; in 1901 through Weitzel, Poe and Canadian locks, 28,403,065 net tons, valued at \$289,906,865. Thus the percentage of increase in tonnage of each year's traffic over that of the preceding year has averaged as follows: 1851-1860, 21 per cent.; 1861-1870, 21 per cent.; 1871-1880, 10 1/4 per cent.; 1881-1890, 19 per cent.; 1891-1900, 12 1/4 per cent.; average 1851-1900, 16 2-3 per cent. Following are some of the most interesting conclusions regarding the traffic of 1902:

|  |                 |
|--|-----------------|
| Total mile-stones .....                              | 29,755,916.637  |
| Total freight carried, tons .....                    | 35,961,146      |
| Total valuation placed on freight carried.....       | \$385,306,300   |
| Average value per ton of freight carried.....        | \$9.66          |
| Total amount paid for freight transportation.....    | \$26,566,189.40 |
| Average distance freight was carried, miles.....     | 827.4           |
| Cost per mile per ton, mills.....                    | .89             |
| Average cost per ton for freight transportation..... | \$0.74          |

|   |              |
|---|--------------|
| Total number of registered vessels using canals..                     | 935          |
| Total number of passages by unregistered craft carrying freight ..... | 490          |
| Time American canal was operated, days.....                           | 256          |
| Time Canadian canal was operated, days.....                           | 264          |
| Total valuation placed on registered vessels.....                     | \$70,997,400 |
| Total number of passengers transported.....                           | 59,377       |
| Freight carried by registered vessels, tons.....                      | 35,896,288   |
| Unregistered vessels, tons .....                                      | 64,848       |
| American vessels, per cent. ....                                      | 96           |
| Canadian vessels, per cent .....                                      | 4            |
| Passengers carried by American vessels, per cent                      | 28           |
| Canadian vessels, per cent .....                                      | 72           |

The number of registered vessels of 400 to 500 ft. in length using the canals in trade to and from Lake Superior was eighty-seven; of 400 to 500 ft., 179; of 200 to 300 ft., 337; of 100 to 200 ft., 248; and of less than 100 ft. in length, eighty-four.

The records show that 458 different vessels in a single trip of each carried 1,990,096 tons.

The maximum traffic for a single day was on Aug. 14 when 253,370 tons of freight were passed through the canals by 127 vessels, whose registered tonnage amounted to 197,633 tons. The minimum traffic for a single day was on Dec. 17 when no freight passed through the canals, although four vessels were locked through whose registered tonnage amounted to 12 tons.

The steamer William Edenborn of the Pittsburgh Steamship Co.'s fleet is credited with having moved the largest amount of freight through the canals, during the season—183,270 tons. This steamer is also credited with the greatest number of mile-tones—158,858,138. The largest single cargo—8,485 tons—was carried by the barge John Smeaton, also of the Steel Corporation fleet. The New York Central's steamer Troy has the greatest number of miles run to her credit—45,340.

COMPARATIVE STATEMENT OF COMMERCE THROUGH UNITED STATES AND CANADIAN CANALS AT SAULT STE. MARIE, MICHIGAN AND ONTARIO, FOR THE SEASONS OF 1901 AND 1902.

| ITEMS.                              | Traffic for 1902.    |                 | Total traffic for |              |
|-------------------------------------|----------------------|-----------------|-------------------|--------------|
|                                     | United States canal. | Canadian canal. | Season 1902.      | Season 1901. |
| Vessel passages:                    |                      |                 |                   |              |
| Steamers, number.....               | 12,738               | 4,331           | 17,069            | 14,372       |
| Sailing, number .....               | 3,927                | 441             | 4,368             | 4,482        |
| Unregistered, number.....           | 923                  | 299             | 1,222             | 1,187        |
| Total, number.....                  | 17,588               | 5,071           | 22,659            | 20,041       |
| Lockages, number .....              | 9,427                | 3,419           | 12,846            | 11,321       |
| Registered tons, vessels.....       | 27,408,021           | 4,547,561       | 31,955,582        | 24,626,976   |
| Freight, net tons .....             | 31,232,795           | 4,728,351       | 35,961,146        | 28,403,065   |
| Passengers, number .....            | 22,778               | 36,599          | 59,377            | 59,663       |
| Coal, hard, net tons .....          | 284,986              | 24,902          | 309,948           | 804,493      |
| Coal, soft, net tons .....          | 3,973,448            | 529,082         | 4,502,530         | 3,788,643    |
| Flour, barrels .....                | 6,072,295            | 2,837,945       | 8,910,240         | 7,684,350    |
| Wheat, bushels.....                 | 48,835,062           | 27,895,903      | 76,730,965        | 52,812,636   |
| Grain other than wheat, bu...       | 21,650,609           | 6,090,213       | 27,740,822        | 24,760,547   |
| Manfd. and pig iron, net tons ..... | 154,666              | 43,486          | 198,152           | 206,443      |
| Salt, barrels .....                 | 283,410              | 159,896         | 443,306           | 443,774      |
| Copper, net tons.....               | 106,459              | 14,153          | 120,612           | 98,601       |
| Iron ore, net tons.....             | 21,796,348           | 2,481,207       | 24,277,555        | 18,090,618   |
| Lumber, M ft. B. M.....             | 1,028,848            | 62,623          | 1,091,471         | 1,072,124    |
| Silver ore, net tons .....          | 1                    | 1               | 1                 | 1            |
| Building stone, net tons.....       | 37,064               | 1,855           | 38,919            | 46,584       |
| General mdse., net tons.....        | 504,610              | 235,490         | 740,100           | 558,041      |

American vessels carried 28 per cent. of the total passengers and Canadian vessels 72 per cent. Unregistered American craft carried 29,106 net tons of freight in 255 passages, or an average of 114 tons and 283 lbs. per passage. Of the 22,659 passages for the season 3,468 were by ninety vessels under 100 tons register with an average register of 36 tons. The total freight carried by such craft amounted to 1,356 tons.

The following table will prove interesting as showing the distribution to other lakes of freight bound eastward from Lake Superior and also the districts from which freight bound to Lake Superior originated:

| EAST BOUND.                  |            |
|------------------------------|------------|
| From Lake Superior ports to— | Net tons.  |
| Lake Michigan ports .....    | 3,334,952  |
| Lake Huron ports .....       | 1,412,434  |
| Lake Erie ports .....        | 25,247,132 |
| Lake Ontario ports .....     | 281,471    |
| Total .....                  | 30,275,989 |

| WEST BOUND.                  |           |
|------------------------------|-----------|
| To Lake Superior ports from— |           |
| Lake Michigan ports .....    | 104,027   |
| Lake Huron ports .....       | 200,838   |
| Lake Erie ports .....        | 5,346,410 |
| Lake Ontario ports .....     | 33,882    |
| Total .....                  | 5,685,157 |

ESTIMATED VALUE OF TOTAL FREIGHT PASSING BOTH AMERICAN AND  
CANADIAN CANALS AT SAULT STE. MARIE, MICHIGAN AND  
ONTARIO, FOR THE SEASON OF 1902.

| ITEMS.                              | Quantity.  | Price per unit | Valuation.    |
|-------------------------------------|------------|----------------|---------------|
| Coal, anthracite, net tons          | 309,948    | \$ 6.25        | \$ 1,937,175  |
| Coal, bituminous, net tons          | 4,502,530  | 3.25           | 14,633,223    |
| Flour, barrels                      | 8,910,240  | 3.50           | 31,185,840    |
| Wheat, bushels                      | 76,730,965 | .72            | 55,246,295    |
| Grain other than wheat, bushels     | 27,740,822 | .92            | 25,521,556    |
| Manufactured iron, net tons         | 184,758    | 110.00         | 20,323,380    |
| Pig iron, net tons                  | 13,394     | 20.75          | 277,925       |
| Salt, barrels                       | 443,306    | .65            | 288,149       |
| Copper (refined and matte) net tons | 120,612    | 190.00         | 22,916,280    |
| Iron ore, net tons                  | 24,277,555 | 3.10           | 75,260,420    |
| Lumber, M ft. B. M.                 | 1,091,471  | 16.25          | 17,796,404    |
| Silver ore, net tons                | 1          | 125.00         | 125           |
| Building stone, net tons            | 38,919     | 12.00          | 467,028       |
| General merchandise, net tons       | 740,100    | 125.00         | 92,512,500    |
| Total                               |            |                | \$358,306,300 |

AMOUNT PAID FOR CARRYING FREIGHT THAT PASSED THROUGH  
UNITED STATES AND CANADIAN CANALS AT SAULT STE.  
MARIE, MICHIGAN AND ONTARIO, SEASON OF 1902.

| ARTICLES.                       | Quantity.  | Rate per unit. | Amount.         |
|---------------------------------|------------|----------------|-----------------|
| Coal, net tons                  | 4,812,478  | \$0.45         | \$ 2,165,615.10 |
| Flour, barrels                  | 8,910,240  | .12            | 1,069,228.80    |
| Wheat, bushels                  | 76,730,965 | .019           | 1,457,888.33    |
| Grain other than wheat, bushels | 27,740,822 | .019           | 527,075.62      |
| Manufactured iron, net tons     | 184,758    | 2.00           | 369,516.00      |
| Pig iron, net tons              | 13,394     | 1.50           | 20,091.00       |
| Salt, barrels                   | 443,306    | .15            | 66,495.90       |
| Copper, net tons                | 120,612    | 1.40           | 168,856.80      |
| Iron ore, net tons              | 24,277,555 | .68            | 16,508,737.40   |
| Lumber, M ft. B. M.             | 1,091,471  | 2.45           | 2,674,103.95    |
| Silver ore, net tons            | 1          | 2.00           | 2.00            |
| Building stone, net tons        | 38,919     | 1.50           | 58,378.50       |
| General merchandise, net tons   | 740,100    | 2.00           | 1,480,200.00    |
| Total                           |            |                | \$26,566,189.40 |

In connection with the foregoing table there is also the following summary of relative values of the different commodities passing through the canals:

|  |       |
|--|-------|
| Coal (anthracite and bituminous)                         | 4.62  |
| Cereals (wheat, rye, oats, corn, barley, flax and flour) | 31.25 |
| Iron (iron ore, manufactured and pig iron)               | 26.75 |
| Copper   | 6.40  |
| Lumber   | 4.95  |
| All other products                                       | 26.03 |

TABLE SHOWING TOTAL FREIGHT, ITS VALUATION, FREIGHT CHARGES,  
AVERAGE HAUL OR DISTANCE FREIGHT WAS CARRIED, AND RATE  
PER TON PER MILE FOR SEASONS 1887 TO 1902.

| Year.  | Total freight, net tons. | Value of freight. | Freight charges. | Average haul. | Freight chgs. per mile-ton. |
|--------|--------------------------|-------------------|------------------|---------------|-----------------------------|
| 1887.. | 5,494,649                | \$ 79,031,757     | \$ 10,075,153    | 811.4         | 2.3.                        |
| 1888.. | 6,411,423                | 82,156,019        | 7,883,077        | 806.4         | 1.5                         |
| 1889.. | 7,516,022                | 83,732,527        | 8,634,246        | 790.4         | 1.5                         |
| 1890.. | 9,041,213                | 102,214,948       | 9,472,214        | 798.2         | 1.3                         |
| 1891.. | 8,888,759                | 128,178,208       | 9,849,022        | 820.4         | 1.35                        |
| 1892.. | 11,214,333               | 135,117,267       | 12,072,850       | 822.4         | 1.31                        |
| 1893.. | 10,796,572               | 145,436,957       | 9,957,483        | 831.9         | 1.1                         |
| 1894.. | 13,195,860               | 143,114,502       | 10,798,310       | 821.1         | .99                         |
| 1895.. | 15,062,580               | 159,575,129       | 14,238,758       | 830.0         | 1.14                        |
| 1896.. | 16,239,061               | 195,146,842       | 13,511,615       | 836.4         | .99                         |
| 1897.. | 18,982,755               | 218,235,927       | 13,220,009       | 841.3         | .88                         |
| 1898.. | 21,284,664               | 233,069,740       | 14,123,896       | 842.6         | .79                         |
| 1899.. | 25,255,810               | 281,364,750       | 21,959,707       | 827.2         | 1.05                        |
| 1900.. | 25,643,073               | 267,041,959       | 24,953,314       | 825.9         | 1.18                        |
| 1901.. | 28,403,065               | 289,906,865       | 23,217,974       | 823.3         | .99                         |
| 1902.. | 35,961,146               | 358,306,300       | 26,566,189       | 827.4         | .89                         |

The American canal records show that vessels necessarily spent 26,197 hours and 31 minutes in the canal, or an average of 1 hour, 29 minutes and 22 seconds, which includes time waiting for lockage and passage through locks and canal, the latter being 1 3/5 miles long. Other delays at canal, which included taking on supplies, waiting for daylight or favorable weather, amounted to 22,000 hours and 10 minutes.

The American canal post office delivered 162,684 pieces of mail during the season, consisting of 144,368 letters, 5,424 postals, 12,057 newspapers and 835 parcels; also returned 1,097 pieces to the city post office after being held 30 days uncalled for, and forwarded 3,839 pieces to new addresses. This shows an increase over the previous year of 44,414 pieces of mail.

SOME HISTORICAL NOTES.

The fall in St. Mary's rapids varies from 16 1/2 to 20 1/2 ft. The first lock was built on the Canadian side of the river by the Hudson Bay Fur Co. in 1798. It was 38 ft. long, 8 ft. 9 in. wide, with a lift of 9 ft. A tow-path was made along the shore for oxen to pull the batteaux and canoes through the upper part of the rapids. This lock, excepting its timber floor and miter-sills, was destroyed in 1814 by United States troops from Mackinaw island under command of Major Holmes.

The next locks were built on the American side of the river by the State of Michigan in 1853 to 1855, and such locks and canal are generally spoken of as the state canal; and 750,000 acres of land in Michigan was granted by congress for their construction. The canal was 1 1/2 miles long, 64 ft. wide at bottom,

100 ft. wide at water surface, and 13 ft. deep. There were two tandem locks of masonry, each 350 by 70 ft. by 11 1/2 ft. on the miter-sills, with a lift of about 9 ft. each. Chas. T. Harvey was superintendent of construction, and the St. Mary's Falls Ship-Canal Co. was the contractor. The locks were destroyed in 1888 to make room for the present Poe lock.

The Weitzel Lock, 515 ft. long, 80 ft. wide in chamber, narrowing to 60 ft. at the gates, with 17 ft. of water on the miter-sills at mean stage, was built by the United States in the years 1870 to 1881. The canal depth was then increased to 16 ft. below its water surface, and its average width was increased to 160 ft.; and the stone slope walls were replaced with timber piers having a vertical face. Gen. Godfrey G. Weitzel was the engineer officer in charge of the district from 1872 to 1882, and Alfred Noble was the assistant engineer in local charge from 1870 to 1882. Boyle & Roach were the principal contractors.

The Canadian canal, 1 1/8 miles long, 150 ft. wide and 22 ft. deep, with lock 900 ft. long, 60 ft. wide, having 22 ft. on the miter-sills, was built on the north side of the river between the years 1888 and 1895. Hon. Collingwood Schreiber was chief engineer of Dominion canals, etc.; and W. G. McNeill Thompson was the government engineer in local charge of construction work. Ryan & Haney were the contractors.

The Poe lock, 800 ft. long, 100 ft. wide, and having 22 ft. of water on the sills, was built by the United States in the years 1887 to 1896. Gen. Orlando M. Poe was the engineer officer in charge of the district from 1884 to 1895; and E. S. Wheeler the assistant engineer in local charge of construction work from 1882 to 1897. Hughes Bros. & Bangs were the principal contractors.

The American canal since its first construction has been deepened to 25 ft., and its entrance piers have been extended so that the total length is now 1 3-5 miles. Its width is variable, being 500 ft. at the upper entrance, 108 ft. at the movable dam, 270 ft. at the basin above locks, and 1,000 ft. at the lower entrance. Dunbar & Sullivan and James B. Donnelly were the principal contractors.

The channel through St. Mary's river has gradually been improved through shoals of sand, clay, boulders, sandstone rock and limestone rock so as to now have a least depth of 20 ft. at mean stage of water over a least width of 300 ft.

The approximate cost in round numbers of the several improvements, is as follows:

|                                     |             |
|-------------------------------------|-------------|
| Locks and canal of 1855             | \$1,000,000 |
| Weitzel lock                        | 1,000,000   |
| Poe lock                            | 3,000,000   |
| Widening and deepening canal        | 3,000,000   |
| Improving channel through river     | 3,000,000   |
| Canadian lock, canal and approaches | 4,000,000   |

Hydraulic power is used for operating the American locks, a pressure of 115 lbs. per square inch being used for the Weitzel lock machinery and a pressure of 380 lbs. for the Poe lock machinery. Electricity generated by water power is used for operating the Canadian lock.

The Poe lock can be filled or emptied in about 7 minutes, and an up-lockage of a boat 350 ft. long has been made in as short an interval as 11 minutes. The gates can be operated or closed in 2 1/4 minutes, although 3 to 5 minutes are usually taken. The Weitzel lock can be operated in about the same time as the Poe lock. The Canadian lock can be operated in about 9 minutes.

CANADIAN INLAND MARINE ASSOCIATION.

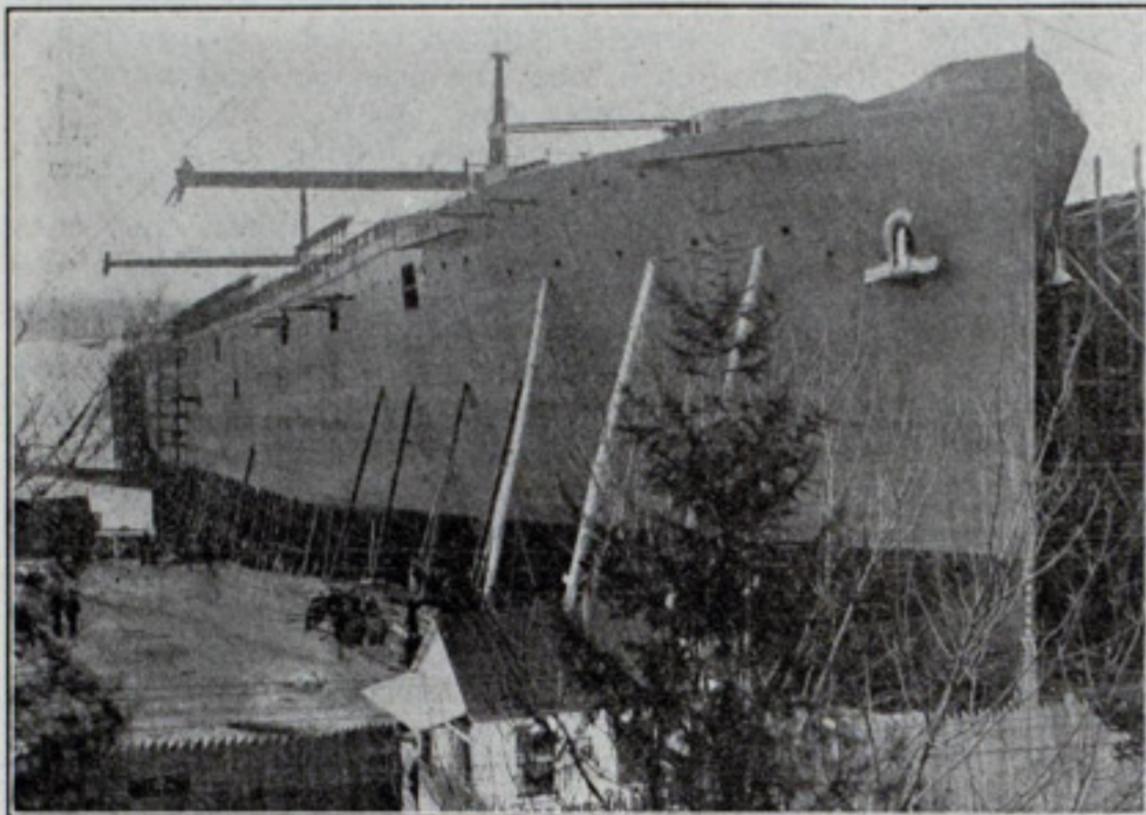
A meeting representative of the merchant marine of the inland waters of Canada was held in Ottawa, April 7, for the purpose of advocating the abolition of tolls on the Canadian canals, the abolition of vessel inspection fees and a readjustment of the customs regulations respecting the payment of officers for working overtime in connection with vessels arriving or leaving port after official hours. The initiative in calling the meeting was taken by the Kingston board of trade, and Ottawa was selected as the place of meeting as it was intended to send a deputation to interview members of the government after the meeting. The petition which was sent out by the Kingston board of trade was adopted by a number of boards of trade throughout Ontario and Quebec. At the meeting the matters referred to in the petition were discussed and the prayer in regard to each was endorsed. It was also decided to organize an association representative of shipping men on the St. Lawrence and the great lakes and the other inland waters of Canada, to consider and take action on all matters affecting their interests. Capt. John Gaskin, formerly outside manager of the Montreal Transportation Co., was elected president.

Those present at the meeting subsequently waited on a number of members of the government and presented the petition. Capt. Gaskin and others presented the views of the shipping men, and promise was given that the views of the deputation would receive every consideration. The result of the meeting was somewhat of a disappointment to the deputation, as not only were the ministers non-committal, but they were inclined to treat the question with some indifference.

## LAUNCH OF THE MINNESOTA.

**Largest Vessel Ever Built on the American Continent—First of the Hill Pacific Ships Building at New London—A Monster Craft.**

An event of national importance is to take place at New London, Conn., on Thursday of this week when there will be launched from the works of the Eastern Ship Building Co. the first of the two mammoth liners building for the Great Northern Steamship Co. The great vessel is to be christened Minnesota by Miss Clara Hill, daughter of Mr. James J. Hill, president of the Great Northern Railway. Mr. Hill is to present at the launching with his steam yacht Wacouta, formerly the Eleanor, and return to New York in his yacht after the launch.



Minnesota on the Stocks.

The steamship Minnesota is the largest vessel ever built in the United States and the greatest deadweight carrier the world has ever seen. She is the first of the two mammoth vessels being built to the order of the Great Northern Steamship Co. and she is also the pioneer vessel of a large fleet to be built by Mr. James J. Hill to develop the transpacific trade in conjunction with his excellent railroad system. Mr. Hill well appreciates all points referring to economy of operation, and this fact accounts for the enormous size of the vessels built for a new undeveloped trade, for the larger the vessel the less the running expenses per ton of cargo carried, and Mr. Hill is confident that his railroad will supply the vessels with approximately full cargoes before they have been on the route six months. The Minnesota is undoubtedly the most interesting vessel ever constructed in the United States. She is the first vessel to be built at the Eastern Ship Building Co.'s works, and this company contracted with Mr. Hill for the construction of the Great Northern steamship before they had a site, tool or working organization, a most remarkable procedure. The Minnesota is an original American product, being designed by Wm. A. Fairburn, naval architect and engineer, and constructed entirely of American material and under the direction of American officials in the New London works. All of the plans for the vessel were made at New London, and no European designers or builders were consulted in any capacity whatever during the construction of the vessel. The Great Northern steamships are truly American vessels. Designed by an American and built by Americans for American owners, they will be operated by Americans under the American flag and will carry the product of American farms and industries to new markets in the orient. Mr. Chas. R. Hanscom, the president of the Eastern Ship Building Co., exhibited a vast amount of courage when he contracted to build such mammoth vessel in a plant that was not of definite existence at the time of contract, and great credit is due all the officials of the company for their work in successfully constructing such gigantic vessels under most unfavorable circumstances.

The Minnesota is shorter than several of the larger European-built vessels. She is also 18 in. narrower than the White Star liners Celtic and Cedric, nevertheless the enormous depth of 55 ft. 6 in., and the greater fullness and capacity of model, is responsible for a gross tonnage equal to that of the White Star vessels, and a deadweight carrying capacity in excess of any vessel built or contemplated. The Minnesota, when loaded to the deep load line fixed by law, will carry a burden of 25,000 tons deadweight. The vessel is 630 ft. long, 73 ft. 6 in. beam, 55 ft. 6 in. deep. She is described as a five-decked, flush-decked, twin-screw, steel steamship, and she receives the highest rating in the British Lloyds. The plans of the Minnesota were accepted by the conservative British classification society practically without modification or comment, which speaks well for the design and scheme of construction. Among special features of the ship are their natural strength and the arrangement of weights and scantlings to give the maximum efficiency and strength for minimum weight and cost. All the

decks are of steel, there being five continuous decks and four partial ones. There are twelve primary transverse bulkheads besides a continuous center-line bulkhead and a large number of partial and division bulkheads. The maximum space between decks is 13 ft. and the minimum 8 ft. 6 in. The double bottom is 6 ft. deep and each compartment of the double bottom is divided into three tanks by watertight divisions. There are five cargo holds forward of the machinery space and four aft. The coal bunkers are located over the boiler room and the end bulkheads are inclined so that the coal will gravitate to the fire rooms with a minimum amount of trimming. A novel feature in the vessel is the double keel. Other innovations are to be found in the pipe chamber and emergency box drains. All the cargo hatches are double, i. e., two of each cargo hold through each deck, there being one on each side of the center-line bulkhead. The ship is designed to practically consist of two separate vessels connected by a fore-and-aft common division. The Minnesota is the first vessel to be classed by a representative classification society that is fitted with wide-spaced hold pillars and compensating girders. There is only one stanchion in each compartment, thus greatly assisting the storage and handling of cargo. The coal bunkers will hold 7,000 tons of coal and the water tanks 6,500 tons of water. The emergency drain will permit of all the pumps in the vessel being connected to any bilged compartment in case of a serious accident. The ship's frames are spaced 27 in. to 30 in. apart. They consist of 12-in channel bars. The thickest plates in the vessel in any one section aggregate 5½ in. and there are several places where the metal exceeds 3 in. The stern of the Minnesota is praised by all who have seen it. The Landley Bossing, modified and much improved, has been adopted and the curves are unusually easy and graceful. The stern castings, including the rudder, are all of cast steel. The deadwood is cut away aft, the rudder is balanced, and the ship is shaped so that the water can flow from screw to screw without hull obstruction. The rudder is a strong, massive member in six pieces. It weighs 40 tons and is carried on a roller-bearing placed on the upper deck. The steering gear will be of the Pfatischer electric type with the mechanical portion of the Wilson and Pirrie type. The bow of the Minnesota has also been much admired. The vessel is unusually fine with a remarkably clear entrance below the normal water line, but the flow-out to the deck is rapid and marked, thus producing great internal cubical capacity and a comfortable dry sea, but with good lines for speed in all kinds of weather. The vessel is fitted with bilge keels and deep ballast tanks, all designed to make the craft comfortable at sea. The deep ballast tanks not only give increased immersion, but they regulate the trim and by decreasing initial stability make the vessel easier in a sea way. Large trimming tanks are also fitted. A decidedly American feature of the vessel's design is the presence of ten large cargo doors on each side of the main hull. These doors are very large and all are placed below the strength deck. They are fitted with rounded corners and large doublings and reinforcing plates. The windlass is of a new type made by the Hyde Windlass Co. It has horizontal wildcats and warping capstans only above deck, the engine and gear being below. The arrangement of deck house is novel, and one is impressed with the fact after inspecting the vessel that she has been designed primarily as a money-making cargo carrier, none of the passenger accommodations being allowed to interfere with the storage or handling of cargo. Again in this regard the symmetry of design working into simplicity and economy of space, is a prominent feature. There seems to be not a cubic foot of waste space in the vessel. The passenger accommodation is above deck, and all the first-class passengers are housed in the upper structure.

The launching weight of the Minnesota, as stated, is 11,000 gross tons and the inclination of launching ways 5/8 in. to the foot. In some places the ways are over 6 ft. wide and their great length from the stern of the ship outboard attracts attention. There is 60 ft. of water in the Thames river opposite the New London ship yard.

The largest anchors to be fitted on board the Minnesota weigh 8½ tons each. They are of the admiral stockless type. The main cables weigh 85 gross tons and are made of 3 3/16-in. diameter special grade of iron. The stream-chain is 1 1/8 in. diameter stud link, and steel tow lines and mooring lines are fitted. The deck houses are not long or continuous, nevertheless expansion joints are worked in all the upper works, and all the decks are steel plated under the wood to ensure continued watertightness. There are four large steel masts to be fitted and four steel derrick posts, swinging all told forty cargo derrick booms. There will be two electric cargo winches at each hatch, and there will not be a single steam winch on board. Electricity will be used almost entirely outside of the machinery space for power, and the steering gear, cargo and coal winches, refrigerating machinery, water pumps, ventilating blowers, etc., will be electric driven. The vessel will also be heated by electricity. The electric plant will be the largest ever placed on board ship. There will be six 90-K. W. Westinghouse generating sets, and it is said that there are 2,000 H. P. of electric motors on each ship.

The propelling engines are of special interest as they are of the triple-expansion, three-cylinder type, built for 250 lbs.

working pressure with the low-pressure cylinder in the center. The cylinders are 29, 51 and 89 in. diameter, respectively, the stroke being 57 in. With eighty revolutions the indicated horse power is 11,000 and the speed of the vessel loaded, under favorable conditions, will be 14 knots. The designed maintained speed is 12 knots average across the Pacific. Steam will be generated by sixteen Niclausse boilers of 1,080 sq. ft. grate surface and 41,000 sq. ft. heating surface, working under induced draft with air heaters. All the pumps and auxiliaries are unusually large and the engineering equipment is probably the finest ever placed in any vessel built, not only in this country, but also abroad. The Minnesota will carry 175 first-class passengers, 125 second-class, 100 third-class, 1,200 steerage and 2,000 troops, beside a crew of 300 men all told.

Officials of the United States Ship Building Co. state that Mr. Nixon is planning to build at New London the large floating hulls that his company may contract for, as the Eastern Ship Building Co. has proven by the construction of the Minnesota that they have a plant that can handle the very largest vessels the world has ever seen. Mr. Nixon's assertion should put an end to the story of the non-permanency of the New London ship yard, and as it has been absorbed by the United States Ship Building Co., it is probable that the plant has a promising future before it. New London is undoubtedly an excellent location for a big ship building establishment and it is predicted that the building of the Minnesota and her sister will be followed by other large vessels which will place the Eastern Ship Building Co. in the front rank among the leading progressive American ship yards.

Joseph McCreery of Toledo, who is the patentee and manufacturer of the McCreery cooling, cleansing, heating, ventilating and humidity regulating system, and whose apparatus is on some of the finest steamships of the country, has undertaken some important work on these vessels, to which attention will be given later on.

#### CAPACITY OF ORE SHIPPING DOCKS.

Duluth, Minn., April 15.—A tabulated statement regarding dimensions, storage capacity, etc., of ore shipping docks, prepared by Chief Engineer Robert Angst of the Duluth & Iron Range railroad, shows that there is an aggregate shipping capacity in ore docks of the upper lakes of about 40,000,000 gross tons, with storage capacity for 958,000 tons. Mr. Angst figures the new capacity of this spring at 106,356 tons, costing upwards of \$1,000,000. This includes the Algoma Central dock, which was built two years ago and not then included in Mr. Angst's figures, though it should have been. Of the storage capacity more than half is at Minnesota ports. The Duluth, Mesabi & Northern docks here have storage capacity aggregating 167,040 gross tons and the Great Northern docks 168,000 tons; add to these two items 168,760 tons storage room in the Duluth & Iron Range docks at Two Harbors and the total for the two Minnesota ports is 503,800 tons, as against 958,000 at all points—Minnesota, Wisconsin and Michigan. The new construction in Minnesota is the No. 3 dock for the Great Northern at this point. Both the other roads contemplate extensions within the coming year.

#### AROUND THE GREAT LAKES.

A new chart in colors of Lake Huron and Georgian bay has just been issued and may be had from the Marine Review.

A Port Colborne dispatch announces that Welland canal tug owners have decided not to go into an association this year.

City of Grand Haven will be the name of the car ferry building at Toledo for the Crosby Line. She will be launched in June.

The steamer D. F. Rose, which went ashore near Put-in-Bay, Lake Erie, last fall, was released Monday and towed to Detroit.

Capt. Robert P. Thompson has purchased the Lynn marine reporting agency at Port Huron and C. D. Thompson will be placed in charge.

Work has been started at Point Edward, opposite Port Huron, on the grain elevator of 1,000,000 bu. capacity for the Grand Trunk Ry.

A cargo of 180,000 bushels of corn, the largest ever loaded at Milwaukee, is bound down the lakes to Buffalo in the steel tow barge Geo. Hartnell.

N. D. Carpenter of Detroit has sold the steamer A. L. Hopkins and consort Emma L. Coyne, the former to Capt. John Dorrington and the latter to Capt. Richard Burns.

Arthur C. Helm, who for many years was connected with the late Capt. W. M. Egan of Chicago, operating a vessel and marine insurance agency, has taken over the business.

The new twin-screw passenger steamer Eastland, building at the works of the Jenks Ship Building Co., Port Huron, for the Michigan Steamship Co., will be launched in a few days.

Another of the large steel freighters building for G. A. Tomlinson and others of Duluth, the Sinaloa, was launched Monday at the West Bay City yard of the American Ship Building Co.

The treasury department last week imposed a fine of \$50 on the Canadian steamer Donnacona for failing to report her presence in American waters at the first port after leaving Canada, which was Chicago.

Capt. Nelson Little, aged seventy years, of Port Huron, recently celebrated his birthday anniversary. Until last year he had never lost a month during the sailing season since he was thirteen years old. At one time he was master of the schooner Thomas Corwin.

Capt. Willis Chilson of Lorain, who last season sailed Steel Corporation steamer Rensselaer, will be shore captain at the Sault for the big fleet this season. Capt. Chambers, who was stationed at the Sault last season, but who prefers sailing, will command the Rensselaer.

The steamer Monroe C. Smith, one of several large ore carriers building by the American Ship Building Co. for the United States Transportation Co., of which the late Capt. W. W. Brown of Cleveland was general manager, will be launched Saturday afternoon at the Lorain yards.

President and general manager Charles M. Heald of the Mutual Transit Co. has appointed Mr. Walter J. Douglass superintendent of the line which will operate the six boats formerly owned by the Northern Steamship Co. H. S. Noble has been appointed general freight agent of the Mutual company.

It is quite evident that the Great Lakes Towing Co. is determined, now that labor troubles and other difficulties are out of the way, to give some attention to the competition that has developed at Buffalo and one or two other places. The first move at Buffalo is a big reduction in rates announced this week.

Capt. Miles Barry of Chicago, who is planning for the operation of the steamers Badger State and Empire State in freight and passenger business between Cleveland and Detroit, has signed a lease for three years of the dock and warehouse at the foot of Front street. The property is owned by P. L. Johnson.

General Freight Agent Edward J. Kelly of the Lake Michigan & Lake Superior Transportation Co., announces departure of the first steamer of that line from Chicago to cover all Lake Superior points on Thursday of this week, with regular sailings semi-weekly, Wednesday and Saturday evenings, throughout the season of navigation.

The Darius Cole and Idlewild, two side-wheel excursion steamers which the magnificent water front of Detroit has made famous, will be taken to Buffalo this summer to run between there and Crystal beach, on the Canadian side. The Cole has been rebuilt above the main deck during the winter. She has a capacity for 1,600 people. The Idlewild, which ran between Toledo, Detroit and Port Huron last summer, carries 1,000.

Work of removing the old swing bridge over the Blackwell canal at the foot of Michigan street, Buffalo, was begun this week. The channel was closed and vessels could neither get up nor down. Pontoons were placed under the bridge and it will be raised and moved to the street. A temporary pontoon bridge has been built adjoining the old bridge for the use of persons living on the island. This can be swung open to permit vessels to pass.

Another of the so-called steel canalers, the steamer Robert Wallace, for the Great Lakes & St. Lawrence Transportation Co. (Wolvin syndicate), was launched a few days ago at the Buffalo works of the American Ship Building Co. She is 255 ft. long, 41 ft. beam and 18 ft. deep, and is the third to be launched of the ten steamers ordered for the St. Lawrence fleet. Miss Elizabeth Thomas christened the steamer. The keel of the large steel freighter to be built for the Miller Transportation Co. will be laid on the berth just vacated by the Wallace. The Miller steamer will be 374 ft. long, 44 ft. beam and 28 ft. deep.

Disappointment is in store for those who hitherto have been fond of the Port Stanley and Rondeau trips across Lake Erie from Cleveland. The little side-wheeler Urania, which has kept the route open, is for sale. She is of British registry and was formerly the Flora, built at Milwaukee. She has beam engines taken from the revenue cutter Andrew Johnson. Both hull and machinery has been well kept up. There are berths in the vessel for ninety-eight cabin passengers and she is allowed 402 excursionists. The Imperial, a freight and passenger steamer of the screw kind, allowed 220 excursionists but having no cabin accommodations, is also for sale by the same parties that offer the Urania. She has steeple-compound engines. Advertisements relating to these vessels will be found elsewhere in this issue.

Rotation in assignment in the engineering corps of the army frequently leaves much to be desired. A man no sooner becomes familiar with his duties than he is transferred to a new post. Capt. D. D. Gaillard is now to be relieved of his duties as engineer in charge of the Lake Superior district and has been ordered to report by letter to the chief engineer at Washington. Maj. Lansing H. Beach is ordered to relieve Capt. Gaillard temporarily, and Capt. Charles L. Potter is to eventually have permanent charge of the Lake Superior district. Maj. Beach, who is to have temporary charge of the district, is now located at Detroit, Mich., and has charge of the eleventh lighthouse district, and of the rivers and harbors on Lake Michigan. Maj. Clinton B. Sears, who formerly had charge of the Lake Superior district, and who has been on duty in the Philippines, is ordered, upon his arrival in this country, to take the station at Nashville, Tenn., and relieve First Lieut. William J. Bardeen, who is engineer of the Nashville district.

## TRANSATLANTIC STEAMSHIP ROUTES.

By Lawrence Irwell.

The safety of ships at sea is, of course, a matter of great importance, not only to passengers but to the steamship companies. Prior to the year 1887 it was admitted that the measures in force for preventing collisions were insufficient for practical purposes, and many plans were then devised for lessening this too prevalent cause of death and disaster. In 1878 the question of distinct tracks for ships making passages in opposite directions was given serious consideration in Europe for the first time, but the futility of the scheme, which looked well on paper, was said to have been demonstrated by ship owners and by the London Ship Masters' Society. In this country the idea of separate tracks had been discussed at an earlier date. The great and ever-increasing number of tracks that converge in certain parts of the world of waters makes fixed routes impracticable and undesirable at those crowded crossings. Fast steamers between this country and Europe or between California and China may find it advantageous to follow separate tracks for outward and homeward passages, so as to avoid crashing into each other when proceeding in diametrically opposite directions. Slow steamers and sailing ships, however, must be provided for, and it must not be forgotten that some of the most serious collisions of former days were between sailing vessels and steamships. In 1873 the French steamer *Ville du Havre* sank shortly after a collision with a British sailing ship, the *Loch Earn*. No less than 226 lives were lost, and if the watertight bulkhead of the sailing vessel had failed to withstand the pressure of the sea water pouring in in immense quantities through her stricken side every person on board both vessels would have been drowned. Eventually the *Loch Earn* sank, but fortunately assistance was at hand. The pioneer Atlantic flyer, the *Oregon*, ran into a schooner which was sailing without lights. Both ships sank within a short time and everybody on board the schooner was lost. As is well known, all the *Oregon*'s passengers were saved. It is possible that there are times when an officer in charge of a steamer defers altering his course till the very last moment. In the meantime the sailing ship officer, fearing that the look-out man on the steamer has not seen his lights, performs some hurried maneuvers and actually precipitates the collision which he was most anxious to avoid.

Winds and currents differentiate the tracks of outward and homeward bound ships to some extent. Take for example the track followed by a ship making her way under sail from an English port to Boston. By looking at a map it would seem that this voyage could best be made by steering in the direction of the setting sun; but considering the fact that westerly winds prevail along this route it is not difficult to see that the longest way round may be the shortest way to her appointed destination. Such a ship steers to the southward, after clearing the English channel, as though bound across the equator, till the twentieth parallel of north latitude is reached, then steers to the westward before favorable winds from the eastward, and when well over on the westward side of the North Atlantic curves to the northward to make her port. By this course she escapes a pitched battle with the adverse gales, is assisted by the gulf stream, and reaches her destination sooner, notwithstanding the longer distance sailed over by following the southern route. When steam was in its infancy the small-powered vessels were unable to make headway against the southwest monsoon when steaming from Bombay (India) to Aden (Arabia) and were compelled to follow a more southerly track than the shortest possible passage. Similar instances of separate routes marked out by meteorological conditions for outward and homeward bound ships are not difficult to find.

To own the fastest transatlantic steamer is a distinction coveted by several of the companies, and some ship is always trying to break the record. The shortest course that can possibly be drawn between two points on the earth's surface is that of a great circle. As a result the most direct track between New York and Queenstown is indicated on a globe by a thread tightly drawn between the ports named. This shortest distance measures only 2,670 miles but its western end passes over the land, so that a deviation has to be made. Moreover, numerous icebergs drift down from the Arctic regions directly across part of this track during the greater part of each year; many fishing vessels lie at anchor on the banks of Newfoundland with their crews, pursuing a dangerous calling, and not infrequently concealed from view by dense fog peculiar to that region, where the waters of the ice-bearing Labrador current and the warm gulf stream meet; and the outlying rocks must be allotted a wide berth. Hence the absolute necessity of keeping to a route which shall approximate nearly to the great circle track, while at the same time combining directness with safety. The nearest available points of Europe and America may some day in the future become important factors in affording a minimum of time and danger on the transatlantic passage. Public opinion tends towards the adoption of White Haven, Nova Scotia, on the Canadian coast, and Milford Haven, England, as the terminal ports. The over sea distance would then be decreased by one-third, and could be accomplished in four days by fast steamers specially built for carrying mails and passengers only. A 30-hours' journey by rail would cover the distance between New York and White-

haven, so that, by following this route, it would be possible for a person starting from New York to reach London in about 5½ days.

It has long been felt that danger from collision might be considerably reduced if passenger steamships crossing the Atlantic were compelled, under heavy penalties, to follow distinct routes on the outward and homeward passages. One of America's most renowned sons, the passage shortener Matthew F. Maury, drew up a scheme as far back as 1856. It was based upon a critical examination of many log books kept on board passenger steamships belonging to the Cunard line and the Collins line. Maury found that the zone traversed by these steamers was about 300 miles when going westward but only about half that width on the homeward track. Having this zone clearly defined on a chart, he took a band of about 20 miles to the northward for his proposed outward track and another band of 20 miles to the southward for his homeward track. These routes were 50 miles apart near Cape Clear (south of Ireland) and 200 miles in about 50° west longitude. He took no account of seasonal requirements, and therefore crossed the banks of Newfoundland at all times, notwithstanding the icebergs, fogs, and helpless fishing vessels, likely to endanger the safety of fast steamers.

In 1878, Ismay, Imrie & Co. (White Star Line) requested the English board of trade to consider the advisability of insisting upon certain outward and homeward tracks being adhered to. The same suggestion had previously been made to the North Atlantic Steamship Conference held at Liverpool in 1876. The proposal was that Maury's plan, with slight modifications, should be adopted. As there was little unanimity among ship owners, nothing was done.

For a long period prior to 1890 the United States hydrographic office had consistently and energetically advocated the adoption of distinct routes, and on each month's issue of that bureau's North Atlantic pilot chart the outward and homeward tracks between New York and Queenstown, which were considered the safest, were clearly marked.

The International Maritime Conference, which met at Washington in 1888, discussed transatlantic tracks in detail, and a resolution was passed that fast steamers during spring and autumn should follow a route leading clear of the Newfoundland banks, in order to avoid the fog and ice of that locality. The conference reported that the compulsory use of a particular route was hedged round with difficulties and could not be recommended.

There is an almost insuperable difficulty in enforcing the rule requiring vessels to proceed at a moderate speed in thick weather or snow. Sailing ships cannot always regulate their speed, even if they would, for once having kept before a freshening gale it is sometimes simply impossible to bring them to the wind without endangering the masts and the safety of all on board. Again, captains of sailing ships urge that vessels answer the helm more readily when moving swiftly through the water; and, moreover, the chance of collision is lessened by shortening the period passed in the fog. As a rule the faster ship stands the best chance in the event of a collision, and having a large number of people aboard—as is usually the case—it is more important that she should survive. Finally, no definition of what is meant by moderate speed has yet been given, and what would be fair speed for a tramp would be very slow for the *Deutschland*.

Although compulsory routes seem to be an impossibility, yet it is undesirable to lay down fixed international rules unless they can be enforced by heavy penalties. The voluntary adoption of certain routes, however, when agreed to by the majority of the great lines secures a certain amount of immunity against disaster, in spite of icebergs and sailing ships. The Washington conference strongly recommended that the various companies owning passenger ships should come to some decision on this point among themselves, so as to establish and maintain certain routes. From March to November no fewer than 700 vessels belonging to the United States, Canada and France are employed in fishing on the Newfoundland banks. Some schooners fish for halibut in the depth of winter. Fishermen's safety is, no doubt, best promoted by their own unceasing vigilance, and a careful compliance with the rules referring to lights and sound signals. It is argued that if fast steamers were kept off the banks the fisherman might become careless and lay themselves open to danger from slower vessels, and when least expected a serious disaster might occur. It is undeniable that the traveling people clamor for quick passages, and that record-breaking is popular. But, till recently, the advantage of keeping clear of the Grand Banks was not appreciated by the majority of the great steamers. Since they have decided to move slowly during fog, they have made a greater effort to avoid the locality where fog is so prevalent.

As a result of the Washington conference the question of outward and homeward routes came within the range of what may be called "practical politics," and in 1891 the Cunard, White Star, Inman, National and Guion companies (the last three now absorbed or defunct) agreed upon distinct routes to be followed by all their ships. At the end of 1892 the North German Lloyd, Hamburg-American, Companie-Générale Transatlantique and Red Star joined the compact, some slight modifications being made in the agreement. Since this time the chosen tracks have been strictly followed and the risk of collision has been reduced in

proportion to the number of vessels using the tracks. Further, a broken-down steamer, or a crew compelled to take to the boats know within moderate limits of error where to steer in order to be rescued from danger as quickly as possible:

The advice of the United States hydrographic office had long been that steamers making for or coming from the English channel should follow the same tracks as those starting from Queenstown going or coming on at the twentieth meridian of west longitude; but the actual courses chosen by the German and French lines did not, till 1899, coincide with the Queenstown route until near the Newfoundland banks, thus enlarging the area within which vessels bound east and west were liable to meet each other. The distance saved was only 6 miles for the northern route and 9 for the southern. Western bound steamships get the benefit of the Labrador current setting to the Southward, and those bound to the east get sufficiently far to the southward to be influenced by the gulf stream. At the same time, along that belt which lies between the outward and homeward tracks, the danger to fishing vessels is reduced to a minimum. To the northward of this unfeasted region the risks of collision are chiefly from the eastward. To the south of this district danger will come from the westward in the form of steamers bound to Europe.

It would be suicidal to keep a careless look-out on the ground that a ship was running along the recognized track and therefore out of harm's way, for the introduction of specified steamship routes does not get rid of the danger always in evidence at converging points, though it certainly makes the chance of disaster less. It is not a great many years since two Danish steamers belonging to the same company, the Geiser and the Thingvalla, proceeding in opposite directions, collided with each other in mid-Atlantic, and loss of life ensued. Such a catastrophe would have been impossible had they kept to distinct outward and homeward routes. On the other hand, a collision like that between two White Star ships, which happened some years ago, may perhaps occur notwithstanding every precaution, on account of the congestion of shipping at the terminals of the routes.

Two giant steamers are about to be built for the Cunard line. They will be larger than any ships now afloat. The enormous momentum of such heavy vessels steaming at a very high rate of speed suggests the necessity of paying the greatest attention to the principle of distinct tracks for outward and homeward routes. All steamers ought to agree to adhere strictly to them. Although navigation is more precise than ever before, danger is always present and whatever tends to greater safety is worthy of adoption.

The agreement at present in force concerning North Atlantic lane routes took effect Jan. 15, 1899. The details are as follows:

Westbound: Jan. 15 to Aug. 14, inclusive—Steer from Fastnet or Bishop Rock on great circle course, but nothing south, to cross the meridian of 47° west on latitude 42° north, thence by either rhumb line or great circle (or even north of the great circle, if an easterly current is encountered) to a position south of Nantucket light vessel, thence to Fire Island light vessel, when bound for New York, or to Five Fathom bank south light vessel, when bound for Philadelphia. From Aug. 15 to Jan. 14, both days inclusive—Steer from Fastnet—or Bishop Rock on great circle course, but nothing south, to cross the meridian of 49° west in latitude 46° north, thence by rhumb line to cross the meridian of 60° west in latitude 43° north, thence also by rhumb line to a position south of Nantucket light vessel, thence to Fire Island light vessel when bound to New York, or Five Fathom bank south light vessel when bound for Philadelphia.

Eastbound: At all seasons of the year steer a course from Sandy Hook light vessel or Five Fathom bank south light vessel—to cross the meridian of 70° west, nothing to the northward of latitude 40° 10'. From Jan. 15 to Aug. 23, both days inclusive—Steer from 40° 10' north and 70° west—by rhumb line to cross the meridian of 47° west in latitude 41° north, and from this last position nothing north of the great circle to Fastnet when bound to the Irish channels, or nothing north of the great circle to Bishop Rock when bound to the English channel. From Aug. 24 to Jan. 24, both days inclusive—Steer from latitude 40° 10' north and longitude 70° west to cross the meridian of 60° west in latitude 42° 0' north, thence by rhumb line to cross the meridian of 45° west in latitude 46° 30' north, and from this last position nothing north of the great circle to Fastnet—when bound to the Irish channel and as near as possible to, but nothing north of the great circle to Bishop Rock, always keeping south of the latitude of Bishop Rock, when bound to the English channel.

General instruction: When courses are changed in the intersections of meridians any time before or after noon, you will note in your logs both distances to and from the meridians that the ship has sailed from noon to noon, and not the distance from the position at noon the day before to the position at noon the day after the meridian is crossed.

The following steamship lines are parties to the above agreement: American, Cunard, White Star, North German Lloyd, Hamburg-American and Atlantic Transport, and it is not improbable that others adhere to it. Sailing vessels are, of course, expected to keep clear of these steam lanes.

#### SHIP BUILDING AT NEWPORT NEWS.

Newport News, Va., April 15.—The new Pacific coast lumber steamer Francis H. Leggett, building for the Hammond Lumber Co. of San Francisco, will be given her builder's trial today or tomorrow and in a few days she will be ready to leave on her long trip to the other coast. Capt. Edward Jahnson, who will command the Leggett, is here with his entire crew. The new boat will engage in the redwood trade along the California coast and is equipped with unusually powerful towing machines which will be used in towing barges laden with redwood. The Leggett will carry out to San Francisco two American-built locomotives, which will be lashed to her deck.

Preparations for the launching of the armored cruiser West Virginia, Saturday, are about completed, and the big ship, the largest warship to be launched for the navy and the first to go overboard of the six vessels of her class authorized by congress, will start down the ways at 1:30 o'clock. The post-launching banquet in honor of Miss Katherine V. White, the sponsor, will be given at the Chamberlin hotel at Old Point following the event at the ship yard.

The battleship Maine is in Hampton Roads and will be inspected this week by the naval board of inspection and survey and by representatives of Cramps' ship yard to determine the extent of the weaknesses reported by Capt. Leutze to the navy department. According to dispatches from Washington the gun platforms and the deck developed considerable weakness after practice firing.

The Old Dominion liner Monroe, recently sent out from the local ship yard, is now running regularly on the route between Newport News, Norfolk and New York and is said to give perfect satisfaction. No advices have been received yet relative to the two new ships the Old Dominion proposes to build.

The thousands of spectators who will assemble at the ship yard Saturday will witness an interesting feat in docking. In the large dry dock will be the United States battleship Missouri and the German cruiser Gazelle, placed end to end. In the smaller dock will be the large seven-masted steel schooner Thomas W. Lawson, the largest sailing ship in the world. Both docks, of course, will be dry and the hulls of all three ships will be exposed to the view of the people in the yard.

It is authoritatively stated that no strike is contemplated by the trades at work in the ship yard this year. Rumors to this effect have been in circulation for some time but a high union labor authority makes the statement that in no department is a strike being considered.

#### PNEUMATIC TOOL PATENTS.

Officials of the Chicago Pneumatic Tool Co. are very much pleased with recent important developments in the pneumatic tool industry favorable to their company and especially the outcome of litigation regarding infringement of patents. They say that one of the most noticeable results of this evidence of stability and full control of their business is the number of exclusive contracts they have secured of late—contracts that give them the right to furnish all the pneumatic tools used for periods of one and two years, as stipulated, by several large railroads, ship yards, etc. It is stated that these contracts were held up in some cases pending the United States court decisions that secured to the Chicago company its ownership of basic pneumatic tool patents.

Among concerns that have purchased pneumatic machinery from the Chicago company of late are the Lake Shore & Michigan Southern Ry. for New Collingwood shops and for various other points on its system; Great Lakes Engineering Works of Detroit; Central Railroad of New Jersey; Wabash and Delaware & Hudson railways; Cambria Steel Co., Johnstown, Pa.; Baldwin Locomotive Works, Philadelphia; Maner & Flockhart, Newark, N. J.; American Bridge Co., Newark, N. J.; American Car & Fdry. Co., Detroit, Mich., and Berwick, Pa., exclusive contract for a year; Lackawanna Steel Co., Buffalo, N. Y.; American Trading Co., New York, N. Y., Brownville Iron Works, Brownville, N. Y.; Omaha Boiler Works, Omaha, Neb.; Boston Bridge Works, Boston; Crerar, Adams & Co., Chicago; Pennsylvania Co., Ft. Wayne, Ind.; Roy H. Beattie, Newport, R. I.; American Locomotive Works, Scranton, Pa.; Erie Railway, Susquehanna, Pa.; Empire Granite & Marble Works, Jackson, Mich.

The Cooley Epocycloidal Engine Co. has been chartered in New Jersey to deal in the patent rights, privileges and concessions of the Cooley Epocycloidal Engine Development Co., the parent concern through which the new company will work. The latter handles patents on Cooley engines, rotary fluid motors and pumps. The incorporators of the new concern are Charles and David W. Farquhar, George T. Taft, Matthew E. Gately, John F. Cooley, William C. Gray, Edward A. Phippen and Henry W. Longfellow, all of Boston and suburbs.

Announcement has been made of the removal of the general offices of the Consolidated Lake Superior Co. from Philadelphia to New York. The reason given for the change is that the financiers most directly interested in the new company are now located in New York.

## MR. FAIRBURN A VERY BUSY MAN.

Mr. William A. Fairburn, naval architect and marine engineer, of New London, Conn., will read a paper before the Association Technique Maritime in Paris early in May upon "The Design of Large Cargo and Passenger Steamships." Last spring Mr. Fairburn had the honor of reading a paper upon "Crane Service Over Ship Building Berths in American Ship Yards" before the Institution of Naval Architects in London, which attracted so much attention that he has presented a paper to the same society this spring upon the subject "Fitting Out Wharf Crane Service in American Ship Yards." It is well known that last fall Mr. Fairburn read a paper before the Society of Naval Architects and Marine Engineers in New York upon the subject "The Water-tube Boiler in the American Merchant Marine" which provoked much discussion and praise. Mr. Fairburn also during the past year also lectured on ship building and shipping in eastern cities and written a variety of articles for the magazines. This, however, has only been his pastime. His serious work has been in designing the hulls and machinery for the Great Northern liners, building at New London, a description of the launch of one of them being published in this issue of the Review.

Mr. Fairburn is a member of the American Society of Naval Architects & Marine Engineers, American Society of Naval Engineers, Institution of Naval Architects, life member of the British Society of Engineers & Ship Builders, member of the French Association Technique Maritime, American Institute of Electrical Engineers, American Society of Mechanical Engineers and the Engineers' Club of New York.

## LAUNCH OF THE RELIANCE.

Reliance, the sixth yacht which the Herreshoffs have constructed for the defense of the America's cup, was launched last week at Bristol, R. I. She is a decided departure on the part of Herreshoff from his other cup defenders and is an excellent example of the American type of flat-floored, fin-keeled boat. Her lines are very easy, with graceful sweeping curves from the bilges into the garboards. Her stern is very flat, so that she will leave but little wake, while her bow, although not quite so broad and flat as that of the Independence, is still very much different from the bow of either the Constitution or the Columbia. She has a long keel but owing to her good beam does not carry so much lead in the bulk as the other cup defenders. Her bow, toward the end, is quite sharp, while her taffrail measures scarcely 8 ft. At the water line forward she is curved like the inside of a saucer. She is likely to go very fast down the wind, her long keel holding her well on her course. Her weakest point is ex-

pected to be on the wind with flattened sheet. The Reliance is built of Tobin bronze and nickel steel, the former in the underbody and the latter in the top sides. She is 141 ft. over all, 25 ft. 6 in. beam and draws 19 ft. 6 in.

## SHIP YARD NOTES.

Lately it was noted that the Tacoma Ship Building Co., Tacoma, Wash., was building a sea-going dredge for R. A. Perry. Mr. J. B. C. Lockwood of Seattle has this contract from Mr. Perry and the dredge is being built for Mr. Lockwood by Joseph A. Sloan of Tacoma.

A contract has been given to the Merrill-Stevens Engineering Co., Jacksonville, Fla., for a side-wheel, light-draught steamer to navigate the Congaree river in South Carolina. The vessel will be of the following dimensions: Length, 185 ft.; beam, 50 ft.; depth 6½ ft. She will be fitted with compound engines, with cylinders of 12 and 29 in. diameter and stroke of 6 ft.

Calvin Austin is the name of a steamer launched from the works of the Harlan & Hollingsworth Co., Wilmington, Del., last week for the Eastern Steamship Co. The steamer is 325 ft. long, 62 ft wide over guards, and 21 ft. deep. The hull is built of steel with a double bottom divided by five watertight bulkheads and a collision bulkhead. The engines are triple-expansion with cylinders of 26, 43 and 71 in. diameter and stroke of 42 in. The vessel is designed for a speed of 20 miles an hour and has been constructed at a cost of \$400,000.

Capt. C. E. Bergman, Snohomish, Wash., is building a new stern-wheel passenger steamer to ply between Snohomish and Everett on the Snohomish river. She will be 119 ft. long, 20 ft. wide and 5 ft. deep. She will be equipped with engines of the usual stern-wheel type, which will be placed well forward. In order to do this the piston rod will have to be lengthened about 20 ft. and will work in carriers. The steamer will be christened Garden City. Messrs Allen & Ballard, naval architects and marine engineers, Seattle, Wash., are her designers.

Sunday outing excursions on the Nickel Plate road begin April 19, 1903, to continue every Sunday until further notice. Fare \$1 each person, in parties of five or more traveling together and returning same day. Tickets good between any two stations within a distance of 100 miles. For particulars apply to nearest ticket agent. E. A. Akers, C. P. & T. A., Cleveland, O. May 7.

It is reported from San Francisco that the submarine torpedo boat Grampus has demonstrated her efficiency as a vessel of war by discharging a torpedo at a range of 350 yards and striking a stationary target squarely in the center.

## BELLEVILLE WATER-TUBE BOILERS

NOW IN USE (FEBRUARY, 1903)

On Board Sea-going Vessels, NOT INCLUDING New Installations Building or Erecting.

|   |            |                                    |   |   |   |   |   |               |
|---|------------|------------------------------------|---|---|---|---|---|---------------|
| French Navy   | -          | -                                  | - | - | - | - | - | 276,460 H. P. |
| English Royal Navy  | -          | -                                  | - | - | - | - | - | 849,300 "     |
| Russian Imperial Navy                                       | -          | -                                  | - | - | - | - | - | 193,900 "     |
| Japanese Imperial Navy                                      | -          | -                                  | - | - | - | - | - | 122,700 "     |
| Austrian Imperial Navy                                      | -          | -                                  | - | - | - | - | - | 32,900 "      |
| Italian Royal Navy  | -          | -                                  | - | - | - | - | - | 13,500 "      |
| Chilian Navy  | -          | -                                  | - | - | - | - | - | 26,500 "      |
| Argentine Navy  | -          | -                                  | - | - | - | - | - | 13,000 "      |
| The "Messageries Maritimes" Company                         | -          | -                                  | - | - | - | - | - | 87,600 "      |
| Chemins de fer de l'Ouest: (The French Western Railway Co.) | Steamships | plying between Dieppe and Newhaven | - | - | - | - | - | 18,500 "      |
| Total Horse Power of Boilers in Use                         | -          | -                                  | - | - | - | - | - | 1,634,360     |

WORKS: Ateliers et Chantiers de l'Ermitage, at Saint-Denis (Seine), France.

TELEGRAPHIC ADDRESS: Belleville, Saint-Denis-Sur-Seine.

## TRADE NOTES.

The San Francisco & San Joaquin Coal Co. of San Francisco has decided to install machinery for the briquetting of coal dust, the high price of coal in California rendering this profitable. The briquetting presses will be driven by electric motors arranged to give any desired speed from 20 R. P. M. to 550 R. P. M. in about fifteen steps. Two 40-H. P. slow-speed, 500-volt, direct-current motors have recently been purchased for this purpose from the Westinghouse Electric & Mfg. Co., together with speed controlling rheostats designed to vary the speed of the motors within the above limits. The controllers will allow the motors to be operated continuously at any of the speeds.

"How to Pack Gas Engine Cylinder Heads" is an interesting leaflet giving full directions for cutting gaskets, preparing the flange and applying the gasket, so that the most efficient service may be obtained. The difficulty of packing cylinder heads of gas engines for stationary, launch or motor service, has been one of the discouraging features in the use of these engines. The methods described in the leaflet have been proved by years of experiment to be successful in avoiding difficulties and securing the best results. Anyone interested in this leaflet can obtain a copy from the H. W. Johns-Manville Co., 100 William street, New York, or their branch offices in Milwaukee, Chicago, St. Louis, New Orleans, Pittsburg, Cleveland, Boston, Philadelphia and London.

The Shelby Steel Tube Co. of Pittsburg, has just sent out a souvenir in the shape of a paper knife made of seamless cold drawn steel. It is made from a small tube, manufactured by the company, part of the tube in its original state serving as the handle and the balance drawn into a sharp edged and finely pointed blade. It illustrates the ease with which the material can be manipulated and the fine finish that can be put upon it. It really makes a very attractive and serviceable souvenir and one which the customers of the Shelby Steel Co. will undoubtedly appreciate.

The Buffalo Forge Co., Buffalo, N. Y., has issued a mailing card devoted to Buffalo disc wheels. The card is combination clay modeling and wash drawing and doubtless represents a great deal of labor. Buffalo disc wheels, it should be noted, keep the air cool in hot offices, engine and boiler rooms, restaurants, workshops and various overheated apartments.

Capt. W. T. Davie of Quebec, died there recently. He owned the wrecking vessels Lord Stanley (sold in 1902 to the Dominion government for hydrographic work on Lake Superior) and also the Lord Strathcona.

Capt. Whiting, president of the trial board at the tests of the submarine Grampus and Pike, wires the navy department from San Francisco that the tests have been successful. Capt. Whiting said that in light tests the Grampus made 8.45 and 8.46 knots and the Pike 8.51 and 8.55 knots. Awash, two tests, the Grampus made 7.6 and 7.53 and the Pike 7.44 and 7.64. Submerged the Grampus made 7.3 and the Pike 7.18 knots. In torpedo firing the Grampus, going at 7.26 knots, made a center hit, while the Pike, going at 7.14 knots, missed the target.

## "VULCABESTON" CONCAVE and CONVEX PACKING RINGS



Used by representative power stations and steam plants for the Piston Rod, Reciprocating and Corliss Valve Stem and Throttle Stem Packing on stationary engines. Will not score the rod. Readily conform to any unevenness in the rod and greatly reduce friction.

Made in pairs Concave and Convex split diagonally, opened laterally and sprung over the rod. This formation tends to press the Convex Rings closely to the rod and the Concave Rings to the box, preventing leakage of steam at either side. Practically indestructible. Will pack satisfactorily against high pressure or superheated steam, and work perfectly in vacuum.

SEND FOR CATALOGUE "V"

### SHEET PACKING

30 to 50 per cent. cheaper than rubber or composition packing  
More durable and efficient.

### ROPE PACKING

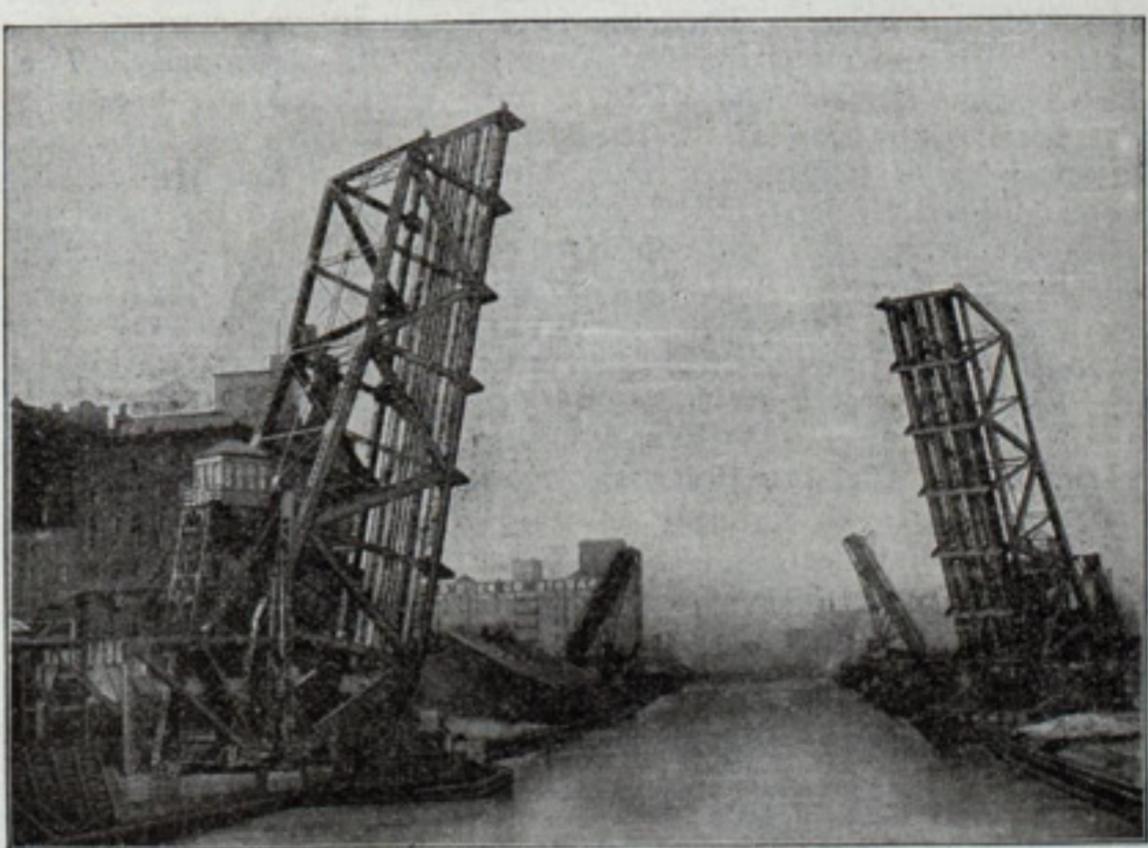
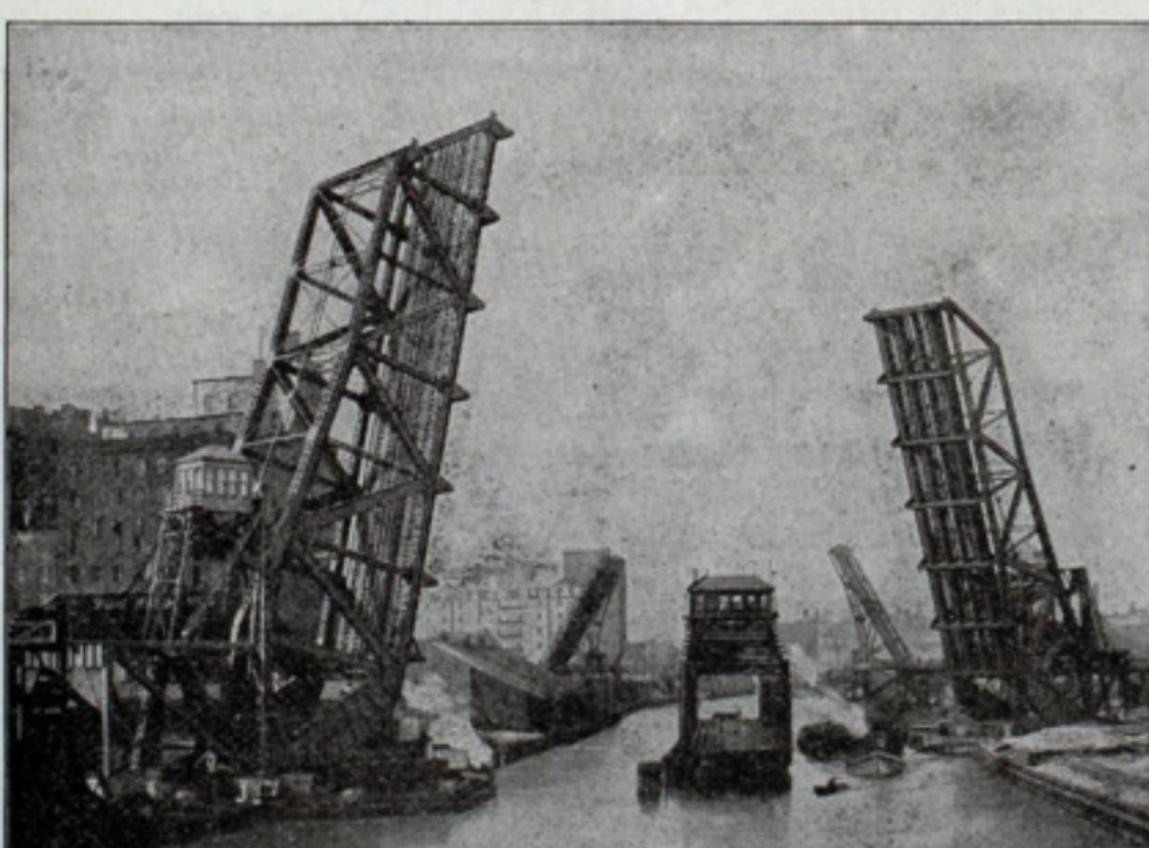
Braided from pure Asbestos yarn vulcanized with Rubber.

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**United Marine Mfg. & Supply Co.,**  
MANUFACTURERS OF AND  
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ALBERT C. JAHL, General Manager,  
100 William St., New York, U. S. A.  
**ELECTRICAL MATERIAL**  
FOR SHIPS AND FORTIFICATIONS.



TWO VIEWS OF

## THE SCHERZER ROLLING LIFT BRIDGE

across the Chicago River at entrance to the Grand Central Station, Chicago, before and after the removal of the old center pier swing bridge, showing the obstruction to navigation caused by the center pier and protection pier of the old swing bridge, and the wide and unobstructed channel given by the new Scherzer Rolling Lift Bridge.

Preliminary Sketches and estimates of cost furnished without charge to responsible parties in any part of the world, upon request accompanied by the necessary data.

**THE SCHERZER ROLLING LIFT BRIDGE CO., Main Offices: 1616 Monadnock Block, CHICAGO, U.S.A.**

## VOYAGES OF THE ICE-BREAKER ERMACK.

Mr. Arthur Gulston recently delivered a lecture before the Institute of Marine Engineers in London upon the "Baltic and Arctic Voyages of the Ermack." Mr. Gulston in his opening said that ice breakers were in existence as far back as the year 1870, the first being a converted tug at Cronstadt. It was, however, only during the last twenty years that they had reached large dimensions. The Ermack, built by Sir W. G. Armstrong, Whitworth & Co., is 335 ft. in length, 71 ft. beam, and with her coals and stores on board has a displacement of about 8,000 tons. Her propelling machinery consists of four sets of triple-expansion engines of 2,500 H. P. each, steam being generated in six very large double-ended boilers that were built for 160 lbs. pressure. The Ermack is capable at half power of putting 1,300 tons of weight on the ice to crush it down, when in her ordinary ice-breaking trim, with a draught of 22 to 23 ft. The bow is enormously strong, and for a considerable distance the frames are only 12 in. apart. The ice-belt at the bow extends to the keel and at the sides of the ship it is 27 ft. deep. The Ermack left the Tyne on her maiden voyage to Cronstadt early in March, 1899, under the command of Capt. Vassilieff, Admiral Makaroff of the Russian navy being also on board. In less than a fortnight after sailing the ice-blink was seen just before dark, the first drift-ice being met with off the western end of the harbor of Reval. In the Gulf of Finland the small drift ice is first met, this gradually grows to a paste, which, in calm weather, soon solidifies into floes. These latter get larger until the solid ice is met, and it is in this that the packs of ice are found. The Ermack proceeded by night through the ice, which was illuminated by the elector projector. On the rocks and islands in the Gulf of Finland the ice forms to an enormous thickness, and the noise occasioned at the bow of the vessel when breaking ice was considerable; but, such is use, after the first day it was scarcely noticed, and the vibration set up forward was very small. The Ermack pursued her way through the ice right up to Cronstadt, the entrance of the ship into that port being the occasion of great excitement, as up to the time of her arrival it had been firmly predicted that the feat was an impossibility. Below Cronstadt the vessel could easily break her way through the ice at 8 knots an hour, the ice-field being from 18 in. to 24 in. thick, with 6 in. of snow upon it. Three days after her arrival at Cronstadt she was ordered to Reval to save steamers that were in danger of being crushed by the ice, and to open the port. Upon arrival at Reval bay it was found that an enormous ice-pack had been formed across the entrance to the bay, 15 miles from the town of Reval. The pack had formed during a northwest gale that had blown the drift-ice from the Baltic into the bay, packing it 3½ miles across, about one-third of a mile wide, and from 20 ft. to 25 ft. thick, completely closing the harbor. In two hours the Ermack succeeded in crushing a way through this ice-pack, which achievement had necessitated fourteen charges, the newly-fallen snow being a great obstruction. During the limited time that the Ermack was on that station she was instrumental in salving eighty-two vessels that were fast in the ice. The lecturer then proceeded to give an account of the Arctic voyage of the Ermack, the object of that exhibition being to test the capabilities of large ice-breakers among Polar ice. On the Arctic trip the Ermack left the Tyne on July 23, 1899, and proceeded to Advent bay, in Ice Fjord, Spitzbergen. She was fully provisioned for twelve months. Advent bay was left on Aug. 5, and on the following day they encountered the first Polar drift-ice. Then the fight began in real earnest, collisions with enormous masses of ice occurring continually. The floes became thicker and older as they proceeded north, and it was soon a question of ice breaking and charging all the time. In speaking of charging it must be understood that the vessel, when stopped by ice, retired 100 yds. or more, got up speed to strike the strong spot, and continued to do so until the obstruction was broken down. The Ermack was also designed for charging astern when desirable. In some of the water lanes it was strange to note how the ice had separated in a vertical cleavage, leaving walls of solid ice on each side of the canal from 12 ft. to 20 ft. thick. With half boiler power the Ermack could force her way through Polar ice 12 ft. to 14 ft. thick at 2½ to 3 knots an hour.

## "Seaboard Steel Castings"

### A Guarantee of Quality.

Open Hearth Steel Castings of the Highest Grade for Locomotive, General Machinery and Shipbuilding Work.

Subject to U. S. Government, Lloyds, Railroad and Other Highest Requirements.

Seaboard Steel Casting Co.,  
Chester, Pa.

## QUESTION OF CANAL TOLLS.

Kingston, April 15.—One of the main arguments of the Kingston mariners who attended the recent large convention of marine men held at Ottawa, and put up such a strong plea for the abolition of canal tolls in the St. Lawrence and Welland canals as a means for diverting trade to an all-Canadian route, was that the Erie canal is free of tolls. This was immediately denied by several prominent newspapers. They maintained that the tolls had been reinstated. To settle this important matter M. L. Henderson, local manager for the Montreal Transportation Co., made enquiry and received this telegram from Charles S. Boyer, superintendent of public works for New York state: "Canal tolls referendum adopted by the lower house of legislature only. It will have to be approved by popular vote and cannot take effect under two years." This would indicate that the Erie canal will be free of tolls for two years at any rate, and possibly longer.

Capt. Andrew Miller, for twenty-eight years in command of steamers plying on the St. Lawrence and Lake Ontario died here Sunday. He was one of the best known mariners, and was well known at Kingston, Buffalo, Syracuse, Rochester, Oswego and Toronto. Flags on nearly all local steamers are at half mast. He was a native of Cape Vincent, and was fifty-eight years old.

The big steamer Chicora, from Toronto is in the government dry dock to undergo repairs.

## REDUCED FARES VIA PENNSYLVANIA LINES.

Excursion tickets will be sold via Pennsylvania Lines as follows:

To St. Louis, Mo., April 26 and 27 account national and international good roads convention.

To St. Louis, Mo., April 29 and May 1, inclusive, account dedication ceremonies, Louisiana Purchase Exposition.

To New Orleans, La., May 1 and 3 inclusive, account the American Medical Association.

To St. Louis, Mo., June 6 and 17 account thirty-first saengerfest of North American Saengerbund.

To Boston, Mass., July 2 to 5, inclusive, account National Educational Association.

For particulars consult ticket agent of Pennsylvania Lines.

George Crouse Cook, instructor in naval architecture at the New York Nautical College, announces that arrangements have been made to place the undergraduates of the naval architecture branch of the school in the yards of certain of the leading ship building companies of the country during the approaching summer vacation, in order that they may gain the practical experience so necessary before undertaking actual work as ship draftsmen. It is therefore suggested that students proposing to take up this work enter for the first course now, spend the summer at a ship yard in practical work, and in the fall complete the second and third courses for the college diploma in naval architecture. The work of the first course explains the principals of laying off, the calculations of form of the initial condition, the methods of construction of wooden and steel ships, and the operations of ship building—that portion of the training which enables the student to comprehend and profit most fully by this ship yard experience.

Owing to increased operating expenses the cross-lake lines engaged in the fruit trade on Lake Michigan have decided to advance the rates on that class of freights 10 per cent.

## Tug, Scow, Etc.

For Sale.—Tug, scow and sand pump. All in good order. Price reasonable. Address Butler Bros., St. Paul, Minn.

Apr. 30.

If you want to KNOW WHY

Dearing Water Tube Boilers are best ? ? ?

Drop us a postal

Dearing Water Tube Boiler Company  
288 to 296 Fort St., West. DETROIT, MICH.

## RUBBER TILING FOR SHIPS.

A very striking catalogue has just been issued by the New York Belting & Packing Co., Ltd., advertising its interlocking rubber tiling. Few concerns would care to put the money into a bit of printing that has been put into this catalogue. The cover design is oriental in conception and is printed in green and brown upon gray stock. Advantages claimed for interlocking tiling over other form of tiles and floor coverings are as follows: It is noiseless, non-slippery, waterproof, thoroughly sanitary and so durable as to last practically a life time without requiring repairs; it may be laid directly upon existing floor, whether of wood, cement, stone or iron, thereby saving the expense of constructing a concrete floor, which is necessary in all other kinds of tiling. The illustrations are all from the three-color process, which, of course, reproduces the various patterns with the utmost fidelity of color. The first illustration is that of the upper-deck landing of the steamship *Vaderland* of the Red Star Line. For steamships the tiling is especially adapted, as it stands the strain and racking without separating, and its non-slippery feature is of the highest value. It has the added advantages of being designed into harmonious color combinations in keeping with any surroundings. This is shown in the reproduction of the color scheme of the Fall River Line steamer *Priscilla*. A beautiful view is that of the main corridor of the Empire building, New York.

## ACTION OF CLAYTON GAS NEVER INJURIOUS.

Editor Marine Review:—On my return from Baltimore, where I equipped the ship *Andora* with one of our fire extinguishing machines, my attention was called to the article in your issue of 26th ulto, entitled "Clayton Fire Extinguisher for Ships," and although this company has not been favored with a copy of the report submitted by order of the secretary of the treasury by the investigating committee therein referred to I have no doubt that your extracts are exact, but as the inspectors' conclusions are apt to be misconstrued, I would ask you, in justice to our system, to point out that whereas test No. 7 proved that tea, steel, fabrics, etc., exposed to the action of Clayton gas during sixty-seven hours sustained no damage, they conclude "that a general cargo would not be damaged to any great extent by the use of these gases," and again "that the gases are more efficient for extinguishing a fire in the hold of a vessel, and with less damage to cargo." The conclusions convey the impression that Clayton gas would have some injurious effect on a general cargo although not to such a great extent as steam. Such an impression is altogether erroneous, seeing that the gas has never done any damage whatsoever to the general cargoes of hundreds of steamers which have been processed. On the contrary, where a fire develops in the cargo of a Claytonized vessel, the damage is restricted to its immediate seat, to which the gas penetrates with avidity, whereas when water or steam is employed the greater damage is generally caused by those elements. In consequence

## Boiler Wanted.

Wanted boiler  $5\frac{1}{2}$  by 11 or 12, with high steam pressure. Must be in good shape and not very old. Address J. M. Clow, Marinette, Wis. April 16.

## Steam Yacht for Sale.

Steam yacht, 35 ft. over all, 7-ft. beam. Fitted for salt water use. Burns kerosene. Is in fine order. Will be sold cheap. J. L. Alberger, 695 Ellicott Square, Buffalo, N. Y. Apr. 30.

## Steamer Imperial for Sale.

Has been running with freight and day passengers (licensed to carry 220) between Windsor, Amherstburg and Pelee Island. No cabin accommodations for passengers. Screw steamer built at Toronto in 1866; rebuilt in 1897. Wooden hull of 109 ft. length and 22 ft. width. Steeple compound engines of 12 and 16 in. Engines were compounded only six years ago and have been well kept up. Boiler of ample size and in good condition. Address Box 42, the Marine Review Pub. Co., Wade Bldg., Cleveland, O. tf

U. S. Engineer Office, Grand Rapids, Mich., April 6, 1903. Sealed proposals for Repair of Piers at St. Joseph and Black Lake, Mich., will be received here until 3 P. M., May 6, 1903, and then publicly opened. Information furnished on application. J. G. WARREN, Major Engrs. April 30

U. S. Engineer Office, Duluth, Minn., Mar. 25, 1903. Sealed proposals for furnishing 7,000 cu. yds. broken stone and 4,000 cu. yds. sand for Concrete Superstructure to breakwater, Marquette, Mich., will be received here until noon April 24, 1903, and then publicly opened. Information on application. D. D. GAILLARD, Capt., Engrs. April 16

**PNEUMATIC TOOLS**  
FOR ALL PURPOSES SIMPLEST AND BEST

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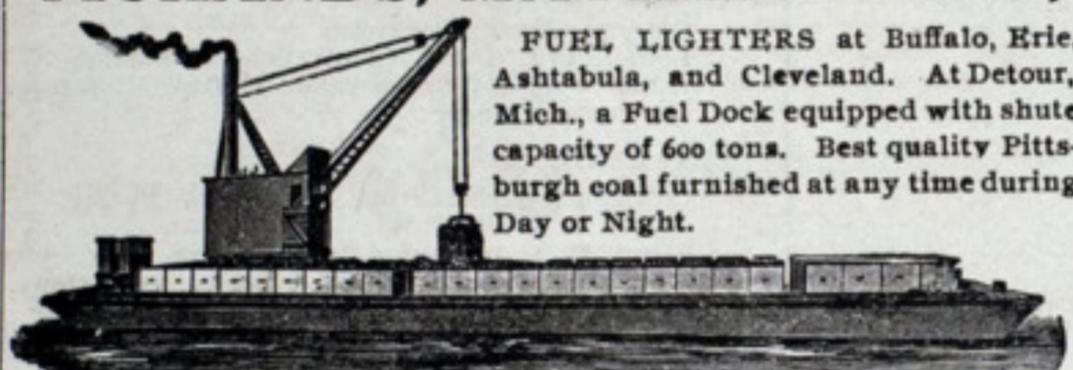
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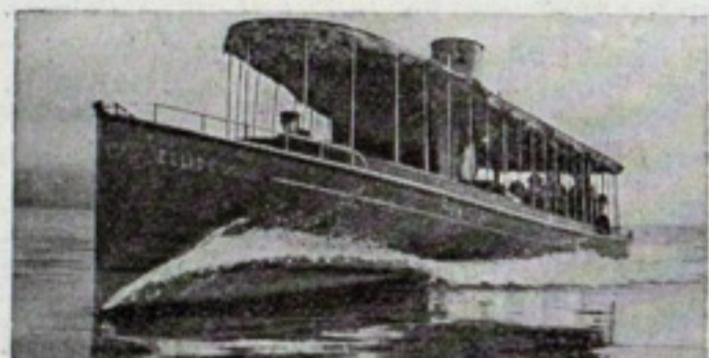
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 Railway Appliances Co. .... Chicago.

## HARDWARE, SHIP.

Topky Brothers .... Ashtabula, O.

## HATCH GEARS.

"Long-Arm" System Co. .... Cleveland.

## HEATING APPARATUS.

Buffalo Forge Co. .... Buffalo.  
 Sturtevant, B. F. Co. .... Boston.

## HOISTS FOR CARGO, ETC.

American Ship Building Co. .... Cleveland.  
 Brown Holting Machinery Co., Inc. .... Cleveland.  
 Chase Machine Co. .... Cleveland.  
 Elwell-Parker Electric Co. .... Cleveland.  
 General Electric Co. .... New York.  
 Hyde Windlass Co. .... Bath, Me.  
 Lidgerwood Mfg. Co. .... New York.  
 Marine Iron Co. .... Bay City.  
 Westinghouse Electric & Mfg. Co. .... Pittsburgh, Pa.

## HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co. .... Cuyahoga Falls, O.

## HOSE FITTINGS.

Farnan Brass Works. .... Cleveland.

## HOSE, RUBBER.

New York Belting & Packing Co. .... New York.

## HYDRAULIC MACHINERY.

Watson-Stillman Co., The .... New York.  
 Wood & Co., R. D. .... Philadelphia.

## ICE MACHINERY.

American Linde Refrigerating Co. .... New York.  
 Roelker, H. B. .... New York.

## INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co. .... Boston.  
 Ashton Valve Co. .... Boston.

## INJECTORS.

American Injector Co. .... Detroit.  
 Crane Co. .... Chicago.  
 Jenkins Bros. .... New York.  
 Lunkenheimer Co. .... Cincinnati.  
 Penberthy Injector Co. .... Detroit, Mich.

## INSURANCE, MARINE.

Brown & Co. .... Buffalo.  
 Brown, W. W. .... Cleveland.  
 Dunham, R. J. .... Chicago.  
 Elphicke, C. W. & Co. .... Chicago.  
 Fleming & Co., P. H. .... Chicago.  
 Hawgood & Co., W. A. .... Cleveland.  
 Helm & Co., D. T. .... Duluth.  
 Hutchinson & Co. .... Cleveland.  
 Insurance Co. of North America .... Philadelphia.  
 McCarthy, T. R. .... Montreal.  
 McCurdy, Geo. L. .... Chicago.  
 Mitchell & Co. .... Cleveland.  
 Peck, Chas. E. & W. F. .... New York and Chicago.  
 Richardson, W. C. .... Cleveland.  
 Sullivan, D. & Co. .... Chicago.  
 Weeks, F. H. .... New York.

## IRON ORE AND PIG IRON.

Bourne-Fuller Co. .... Cleveland.  
 Hanna, M. A. & Co. .... Cleveland.  
 Pickands, Mather & Co. .... Cleveland.

## LATHE, FOR CUTTING PIPE THREADS.

Kent Machine Works .... Brooklyn, N. Y.

## LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Marine Construction & D. D. Co. ....  
 Mariner's Harbor, S. I., N. Y.  
 Truscott Boat Mfg. Co. .... St. Joseph, Mich.  
 Warrington Iron Works .... Chicago.  
 Willard, Chas. P. .... Chicago.

## LIFE FLOATS.

Carley Life Float Co. .... New York.

## LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co. .... Pittsburgh.  
 Drein, Thos. & Son .... Wilmington, Del.  
 Kahnweiler's Sons, D. .... New York.  
 Lane & DeGroot .... Long Island City, N. Y.  
 Marine Construction & Dry Dock Co. ....  
 Mariner's Harbor, S. I., N. Y.

## LIGHTS, SIDE AND SIGNAL.

Helvig, H. A. J. .... New York.  
 Russell & Watson .... Buffalo.

## LOGS.

Walker & Sons, Thomas .... Birmingham, Eng.  
 Nicholson Ship Log Co. .... Cleveland.  
 Also Ship Chandlers.

## LUMBER.

Martin-Barriss Co. .... Cleveland.  
 Moran Bros. Co. .... Seattle, Wash.

## MACHINISTS.

Chase Machine Co. .... Cleveland.  
 Macbeth Iron Co. .... Cleveland.  
 Union Machine & Boiler Co. .... Cleveland.  
 Ward Machine Co. .... Cleveland.

## MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc. .... Philadelphia.

## MACHINERY, NEW AND SECOND HAND.

Bowler & Co., Geo. H. .... Cleveland.  
 Clyde Machine Works. .... Chicago.

## MAN-HOLES, SWING DOORS, ETC.

"Long-Arm" System Co. .... Cleveland.

## MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I. .... East Boston, Mass.

## MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W. .... New York.

## MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co. .... Cleveland.  
 Bloomsburg & Co., H. .... Baltimore, Md.  
 Buffalo Forge Co. .... Buffalo.  
 Detroit Ship Building Co. .... Detroit.  
 Sturtevant, B. F. Co. .... Boston.

## METALLIC PACKING.

American Metallic Packing Co. .... Cleveland.  
 Hayden Mfg. Co., N. L. .... Columbus, O.  
 Katzenstein, L. & Co. .... New York.  
 U. S. Metallic Packing Co. .... Philadelphia.

## METAL POLISH.

Bertram's Oil Polish Co. .... Boston.

## MOTORS, GENERATORS—ELECTRIC.

Buffalo Forge Co. .... Buffalo.  
 Electro-Dynamic Co. .... Philadelphia.  
 Elwell-Parker Electric Co. .... Cleveland.  
 General Electric Co. .... Schenectady, N. Y.  
 "Long Arm" System Co. .... Cleveland.  
 Seidler-Miner Electric Co. .... Detroit.  
 Sturtevant, B. F. Co. .... Boston.  
 United Marine Mfg. & Supply Co. .... New York.  
 Westinghouse Electric & Mfg. Co. .... Pittsburgh, Pa.

## NAUTICAL INSTRUMENTS.

Bliss, John & Co. .... New York.  
 Ritchie, E. S. & Sons .... Brookline, Mass.

## NAVAL ARCHITECTS.

Gaskin, Edward .... Buffalo.  
 Kidd, Joseph .... Duluth, Minn.  
 Logan, Robert .... Cleveland.  
 Mosher, Chas. D. .... New York.  
 Newman, R. L. .... New York.  
 Sadler, Perkins & Field. .... New York.  
 Wood, W. J. .... Chicago.

## OAKUM.

DeGrauw, Aymar & Co. .... New York.  
 Stratford Oakum Co. .... Jersey City, N. J.

## OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph .... Jersey City, N. J.  
 Standard Oil Co. .... Cleveland.

## PACKING.

American Metallic Packing Co. .... Cleveland.  
 American Steam Packing Co. .... Boston.  
 Crane Co. .... Chicago.  
 Hayden Mfg. Co., N. L. .... Columbus, O.  
 Jenkins Bros. .... New York.  
 Katzenstein, L. & Co. .... New York.  
 New York Belting & Packing Co. .... New York.  
 United States Metallic Packing Co. .... Philadelphia.

## PAINTS.

Baker, Howard H. & Co. .... Buffalo.  
 Berry Bros., Ltd. .... Detroit.  
 Mohawk Paint & Chemical Co. .... New York.  
 New Jersey Zinc Co. .... New York.  
 Topky Brothers .... Ashtabula, O.  
 Upson-Walton Co. .... Cleveland.

## PATENT ATTORNEYS.

Thurston & Bates .... Cleveland.

## PATTERN SHOP MACHINERY.

Atlantic Works, Inc. .... Philadelphia.

## PIPE—BRASS AND COPPER, IRON PIPE SIZE.

Waterbury Brass Co. .... New York.

## PIPE, WROUGHT IRON.

Bourne-Fuller Co. .... Cleveland.  
 Crane Co. .... Chicago.  
 Macbeth Iron Co. .... Cleveland.

## PLANING MILL MACHINERY.

Atlantic Works, Inc. .... Philadelphia.

## PLATE BENDING AND PLANING MACHINES.

Wood & Co., R. D. .... Philadelphia.

## PLUMBING, MARINE.

Mott, J. L., Iron Works .... New York.  
 Reilly Repair & Supply Co., James .... New York.  
 Sands, Alfred B. & Son .... New York.

## PNEUMATIC TOOLS.

Allen, John F. .... New York.

Chicago Pneumatic Tool Co. .... Chicago.

Railway Appliances Co. .... Chicago.

## POLISH FOR METALS.

Bertram's Oil Polish Co. .... Boston.

## POWER DOORS AND HATCHES.

"Long-Arm" System Co. .... Cleveland.

## PRESSURE REGULATORS.

## BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

## PROPELLER WHEELS.

American Ship Building Co. .... Cleveland.  
 Atlantic Works .... East Boston, Mass.  
 Baltimore Ship Building & Dry Dock Co. Baltimore.  
 Bath Iron Works, Ltd. .... Bath, Me.  
 Cramp, Wm. & Sons. .... Philadelphia.  
 Crescent Ship Yard Co. .... Elizabethport, N. J.  
 Detroit Ship Building Co. .... Detroit.  
 Fore River Ship & Engine Co. .... Quincy, Mass.  
 Great Lakes Engineering Works. .... Detroit.  
 Hyde Windlass Co. .... Bath, Me.  
 Jenks Ship Building Co. .... Port Huron, Mich.  
 Lockwood Mfg. Co. .... East Boston, Mass.  
 Manitowoc Dry Dock Co. .... Manitowoc, Wis.  
 Marine Construction & Dry Dock Co. ....  
 Mariner's Harbor, S. I., N. Y.  
 Maryland Steel Co. .... Sparrow's Point, Md.  
 Milwaukee Dry Dock Co. .... Milwaukee.  
 Moran Bros. Co. .... Seattle, Wash.  
 Neafie & Levy Ship & Engine Bldg. Co. .... Phila.  
 Newport News Ship Bldg. Co. .... Newport News, Va.  
 Phosphor Bronze Smelting Co., Ltd. .... Philadelphia.  
 Pusey & Jones Co. .... Wilmington, Del.  
 Risdon Iron Works. .... San Francisco.  
 Roelker, H. B. .... New York.  
 Sheriffs Mfg. Co. .... Milwaukee.  
 Superior Ship Building Co. .... Superior, Wis.  
 Thropp & Sons Co., J. E. .... Trenton, N. J.  
 Trigg, Wm. R. Co. .... Richmond, Va.  
 Trout, H. G. .... Buffalo.  
 United States Ship Building Co. .... New York.

## PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co. .... Cleveland.  
 General Electric Co. .... Schenectady, N. Y.  
 Siedler-Miner Electric Co. .... Detroit.  
 Westinghouse Electric & Mfg. Co. .... Pittsburgh, Pa.

## PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co. .... New York.  
 Clyde Machine Works .... Chicago.  
 Great Lakes Engineering Works. .... Detroit.  
 Kingsford Foundry & Machine Wks. Oswego, N. Y.  
 Long Arm System Co. .... Cleveland.

## PUNCHES, RIVETERS, SHEARS.

Chicago Pneumatic Tool Co. .... Chicago.  
 REFRIGERATING APPARATUS.

Roelker, H. B. .... New York.

REGISTER FOR CLASSIFICATION OF VESSELS.  
 Great Lakes Register .... Cleveland.  
 Record of American & Foreign Shipping. New York.

RELEASING HOOKS FOR DETACHING BOATS.  
 Standard Automatic Releasing Hook Co. New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.  
 Bourne-Fuller Co. .... Cleveland.

## RANGES.

Russell & Watson .... Buffalo.  
 RIVETS—BRASS AND COPPER.  
 Waterbury Brass Co. .... New York.

## RUBBER INSULATED WIRES.

Roebling's Sons, Jno. A. .... New York and Cleveland.

## SAFETY VALVES.

American Steam Gauge Co. .... Boston.  
 Ashton Valve Co. .... Boston.  
 Hayden Mfg. Co., N. L. .... Columbus, O.  
 Lunkenheimer Co. .... Cincinnati.

## SAIL MAKERS.

Baker, Howard H. & Co. .... Buffalo.  
 Upson-Walton Co. .... Cleveland.  
 Wilson & Sisby .... Boston.

## SALVAGE COMPANIES.

See Wrecking Companies.

## SCHOOLS—NAUTICAL, ENGINEERING.

Chicago Nautical School .... Chicago.

## SEARCH LIGHTS.

Elwell-Parker Electric Co. .... Cleveland.  
 General Electric Co. .... Schenectady, N. Y.  
 Siedler-Miner Electric Co. .... Detroit.  
 Westinghouse Electric & Mfg. Co. .... Pittsburgh, Pa.

## SHEARS.

See Punches, Rivets, and Shears.

## SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co. .... Cleveland.

## SHIP BUILDERS.

American Ship Building Co. .... Cleveland.  
 Atlantic Works .... East Boston, Mass.  
 Baltimore Ship Building & Dry Dock Co. Baltimore.  
 Bath Iron Works, Ltd. .... Bath, Me.  
 Buffalo Dry Dock Co. .... Buffalo.  
 Columbia Iron Works .... Port Huron.  
 Cramp, Wm. & Sons. .... Philadelphia.

Craig Ship Building Co. .... Toledo, O.  
 Chicago Ship Building Co. .... Chicago.  
 Crescent Ship Yard Co. .... Elizabethport, N. J.  
 Detroit Ship Building Co. .... Detroit.  
 Fore River Ship & Engine Co. .... Quincy, Mass.  
 Great Lakes Engineering Works. .... Detroit.  
 Jenks Ship Building Co. .... Port Huron, Mich.  
 Lockwood Mfg. Co. .... East Boston, Mass.  
 Manitowoc Dry Dock Co. .... Manitowoc, Wis.  
 Marine Construction & Dry Dock Co. ....  
 Mariner's Harbor, S. I., N. Y.

Maryland Steel Co. .... Sparrow's Point, Md.  
 Milwaukee Dry Dock Co. .... Milwaukee.  
 Moran Bros. Co. .... Seattle, Wash.  
 Neafie & Levy Ship & Engine Bldg. Co. .... Phila.  
 Newport News Ship Bldg. Co. .... Newport News, Va.  
 Pusey & Jones Co. .... Wilmington, Del.  
 Risdon Iron Works. .... San Francisco.  
 Roach's Ship Yard .... Chester, Pa.  
 Smith & Son, Abram .... Algonac, Mich.  
 Trigg, Wm. R. Co. .... Richmond, Va.  
 United States Ship Building Co. .... New York.  
 Warrington Iron Works. .... Chicago.  
 Willard, Chas. P. & Co. .... Chicago.

## SHIP CHANDLERS.

Baker, Howard H. & Co. .... Buffalo.  
 Moran Bros. Co. .... Seattle, Wash.  
 Relli Repair & Supply Co., James. .... New York.  
 Upson-Walton Co. .... Cleveland.

## SHIP LANTERNS AND LAMPS.

Helvig, H. A. J. .... New York.  
 Page Bros. & Co. .... New York.  
 Russell & Watson. .... Buffalo.

## SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co. .... Jersey City, N. J.

## SPARS—LARGE SIZES.

Moran Bros. Co. .... Seattle, Wash.

## STAYBOLTS, IRON OR STEEL, HOLLOW, OR SOLID.

Falls Hollow Staybolt Co. .... Cuyahoga Falls, O.

## STEAM VESSELS FOR SALE.

Elwell, Jas. W. & Co. .... New York.  
 Holmes, Samuel. .... New York.  
 King, Rufus S. .... New York.  
 McCarthy, T. R. .... Montreal, Can.  
 Newman, R. L. .... New York.  
 Weeks, F. H. .... New York.

## STEAMSHIP LINES, PASS. AND FREIGHT.

American Line. .... New York.  
 Erie & Western Trans. Co. .... Buffalo.  
 International Nav. Co. .... Philadelphia.  
 Pere Marquette R. R. & S. S. Line. .... Milwaukee.  
 Red Star Line. .... New York.

## STEEL CASTINGS.

Seaboard Steel Casting Co. .... Chester, Pa.  
 Macbeth Iron Co. .... Cleveland.

## STEERING APPARATUS.

American Ship Building Co. .... Cleveland.  
 Chase Machine Co. .... Cleveland.  
 Dake Engine Co. .... Grand Haven, Mich.  
 Detroit Shipbuilding Co. .... Detroit.  
 Electro-Dynamic Co. .... Philadelphia.  
 Hyde Windlass Co. .... Bath, Me.  
 Jenks Ship Building Co. .... Port Huron, Mich.  
 Sheriff Mfg. Co. .... Milwaukee.

## STOCKS, BONDS, SECURITIES.

Brown, W. W. .... Cleveland.  
 Fahey & Co. .... Cleveland.

## SUBMARINE DIVING APPARATUS.

Morse & Son, A. J. .... Boston.  
 Schrader's Son, A. .... New York.

## SURVEYORS, MARINE.

Gaskin, Edward. .... Buffalo.  
 Newman, R. L. .... New York.  
 See, Horace. .... New York.  
 Wood, W. J. .... Chicago.

## TESTS OF MATERIAL.

Hunt, Robert W. & Co. .... Chicago.  
 Pittsburgh Testing Laboratory, Ltd. .... Pittsburgh.

TILING, INTERLOCKING RUBBER.  
 New York Belting & Packing Co. .... New York.

## TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Allen, John F. .... New York.  
 Chicago Pneumatic Tool Co. .... Chicago.  
 Railway Appliances Co. .... Chicago.  
 Watson-Stillman Co. .... New York.

## TOOLS, WOOD WORKING.

Atlantic Works, Inc. .... Philadelphia.

## TOWING MACHINES.

American Ship Windlass Co. .... Providence, R. I.  
 Chase Machine Co. .... Cleveland.

## TOWING COMPANIES.

Donnelly Salvage & Wrecking Co. .... Kingston, Ont.  
 Midland Towing & Wrecking Co., Ltd. .... Midland, Ont.

## TRAPS, STEAM.

Kiley & Mueller. .... New York.

## TRUCKS.

Boston & Lockport Block Co. .... Boston.

## TUBING, SEAMLESS.

National Tube Co. .... Pittsburgh.  
 Waterbury Brass Co. .... New York.

## VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co. .... Boston.  
 Ashton Valve Co. .... Boston.  
 Crane Co. .... Chicago.  
 Farnan Brass Works. .... Cleveland.  
 Hayden Mfg. Co., N. L. .... Columbus, O.  
 Jenkins Bros. .... New York.  
 Kiley & Mueller. .... New York.  
 Lunkenheimer Co. .... Cincinnati.  
 Ross Valve Co. .... Troy, N. Y.

## VALVES FOR WATER AND GAS.

Wood & Co., R. D. .... Philadelphia.  
 Ross Valve Co. .... Troy, N. Y.

## VARNISHES.

Berry Brothers, Ltd. .... Detroit.  
 New Jersey Zinc Co. .... New York.  
 Also Ship Chandlers.

## VESSEL CASTINGS.

American Ship Building Co. .... Cleveland.  
 Macbeth Iron Co. .... Cleveland.

## VESSEL FURNISHINGS.

Sterling & Welch Co. .... Cleveland.  
 Williams & Rodgers Co., The. .... Cleveland.

## VESSEL AND FREIGHT AGENTS.

Boland, John J. .... Buffalo.  
 Brown & Co. .... Buffalo.  
 Brown, W. W. .... Cleveland.  
 Dunham, R. J. .... Chicago.  
 Elwell, Jas. W. & Co. .... New York.  
 Elphicke, C. W. & Co. .... Chicago.  
 Fleming & Co., P. H. .... Chicago.  
 Hall & Root. .... Buffalo.  
 Helm & Co., D. T. .... Duluth.  
 Hawgood & Co., W. A. .... Cleveland.  
 Holmes, Samuel. .... New York.  
 Hutchinson & Co. .... Cleveland.  
 King, Rufus S. .... New York.  
 McCarthy, T. R. .... Montreal.  
 Newman, R. L. .... New York.  
 Mitchell & Co. .... Cleveland.  
 Richardson, W. C. .... Chicago.  
 Sullivan, D. & Co. .... New York.  
 Weeks, F. H. .... New York.

## VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co. .... Buffalo.  
 Sturtevant, B. F. Co. .... Boston.

## WIRE—BRASS AND COPPER.

Waterbury Brass Co. .... New York.

## WIRE ROPE AND WIRE ROPE FITTINGS.

Baker, H. H. & Co. .... Buffalo.  
 DeGrauw, Aymar & Co. .... New York.  
 Upson-Walton Co. .... Cleveland.

## WHISTLES, STEAM.

American Steam Gauge Co. .... Boston.  
 Ashton Valve Co. .... Boston.  
 Farnan Brass Works. .... Cleveland.  
 Lunkenheimer Co. .... Cincinnati.

WHITE METAL—SHEETS, RODS AND WIRE.  
 Waterbury Brass Co. .... New York.

## WINDLASSES.

American Ship Windlass Co. .... Providence, R. I.  
 American Ship Building Co. .... Cleveland.  
 Hyde Windlass Co. .... Bath, Me.  
 Jenks Ship Building Co. .... Port Huron, Mich.

## WINCHES.

American Ship Windlass Co. .... Providence, R. I.  
 Hyde Windlass Co. .... Bath, Me.

## WOOD WORKING MACHINERY.

Atlantic Works, Inc. .... Philadelphia.

## WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co. .... Kingston, Ont.  
 Midland Towing & Wrecking Co., Ltd. .... Midland, Ont.

## YACHT AND BOAT BUILDERS.

Drein, Thos. & Son. .... Wilmington, Del.  
 Lane & DeGroot. .... Long Island City, N. Y.  
 Marine Construction & Dry Dock Co. .... New York.  
 Truscott Boat Mfg. Co. .... St. Joseph, Mich.  
 Warrington Iron Works. .... Chicago.  
 Willard, Chas. P. & Co. .... Chicago.

## YAWLS.

Drein, Thos. & Son. .... Wilmington, Del.  
 Lane & DeGroot. .... Long Island City, N. Y.

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No. 32, Fast Mail .... \*11:25am \*11:30am  
No. 44, Ac via Sandusky. .... \*1:40pm .....  
No. 46, Southwestern Ex. .... ..... \*3:00pm .....  
No. 106, Conneaut Accom. .... ..... \*4:30pm .....  
No. 6, Lim Fast Mail. .... \*5:40pm \*5:45pm  
No. 26, 20th Cent L. m. .... \*7:40pm \*7:43pm  
No. 10, C. N Y & B Sp. .... \*7:30pm \*7:50pm  
No. 16, New Eng Ex. .... \*10:30pm \*10:35pm  
No. 2, Day Express. .... \*9:10pm \*9:25pm  
No. 126, Norwalk Accom. .... \*7:50am .....

#### Arrive

#### from

#### Depart

#### East West

No. 11, Southwestern Lim. .... \*3:25am .....  
No. 7, Day Express. .... \*3:30am \*3:55am  
No. 15, Bost & Chi Sp. .... \*7:15am .....  
No. 19, Lake Shore Lim. .... \*7:20am .....  
No. 23, Western Express. .... \*10:30am \*10:35am  
No. 33, Southern Express. .... \*12:25pm .....  
No. 133, Cleve & Det Ex. .... \*12:45pm .....  
No. 47, Accommodation. .... \*11:20am \*12:00pm  
No. 141, Sandusky Accom. .... ..... \*3:10pm .....  
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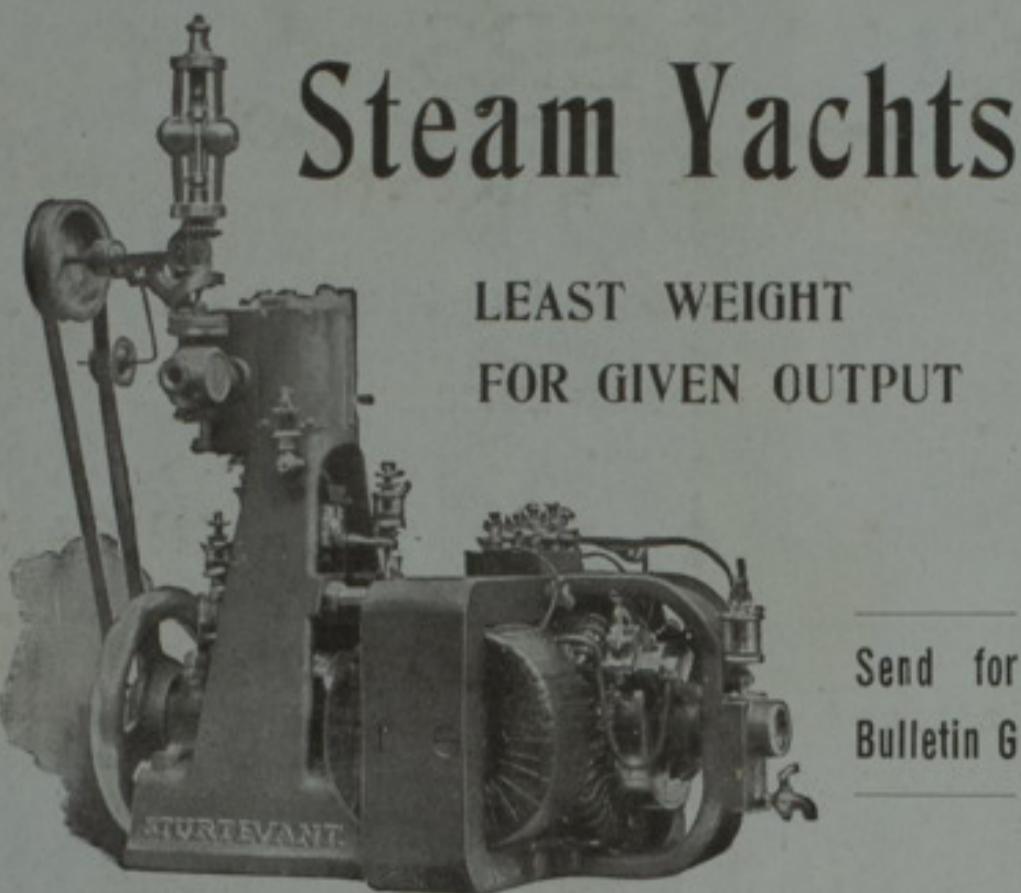
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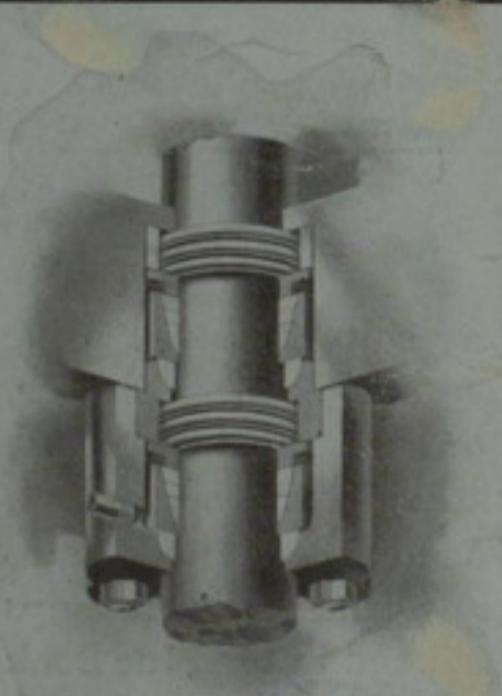
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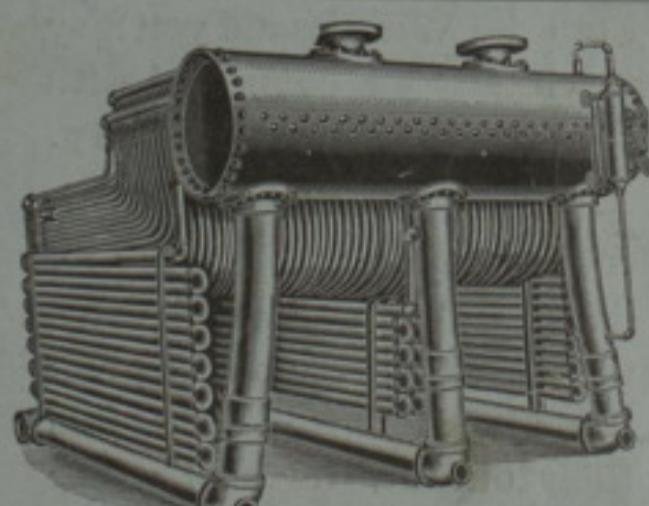
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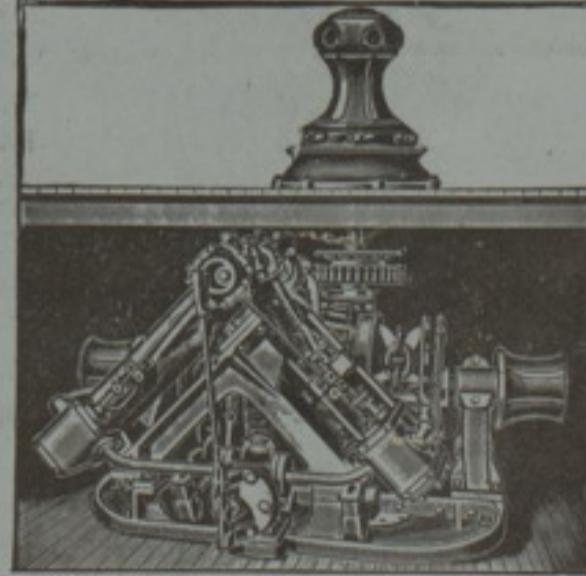
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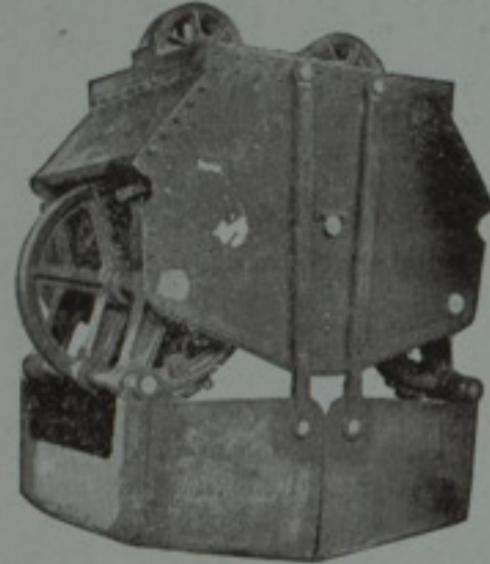
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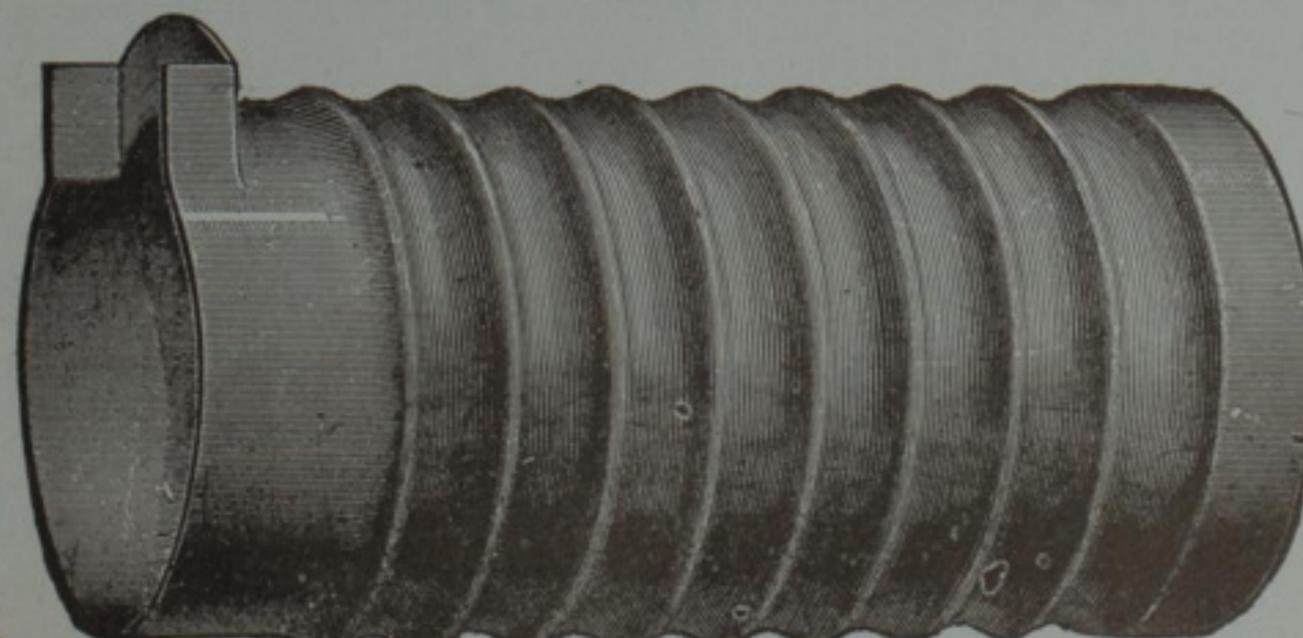
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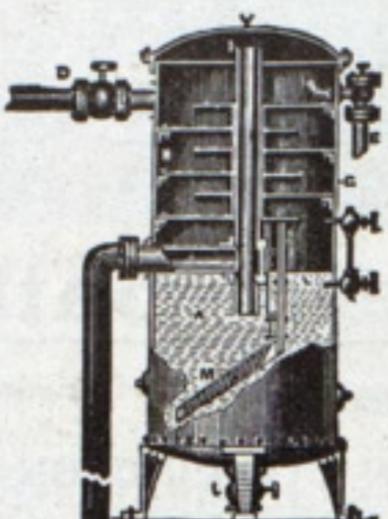
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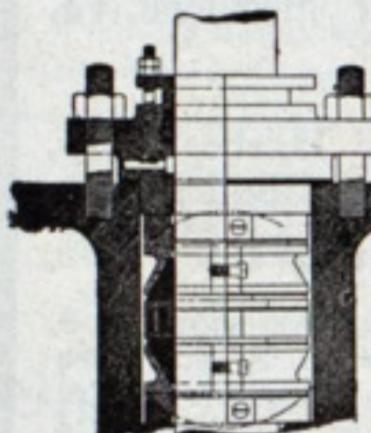
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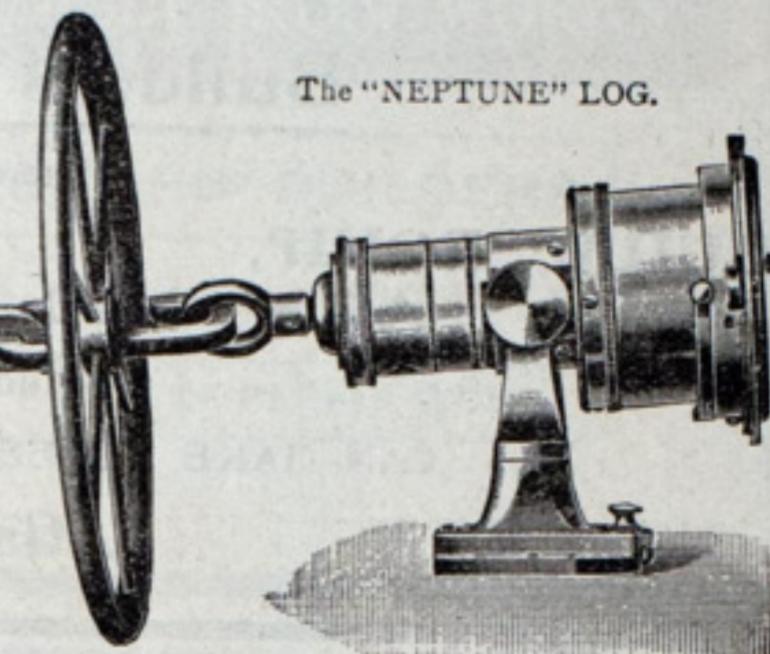
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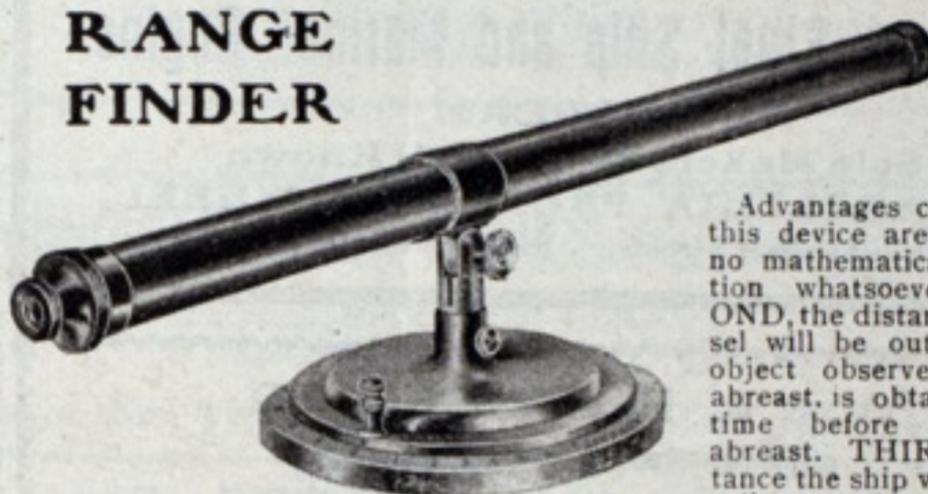
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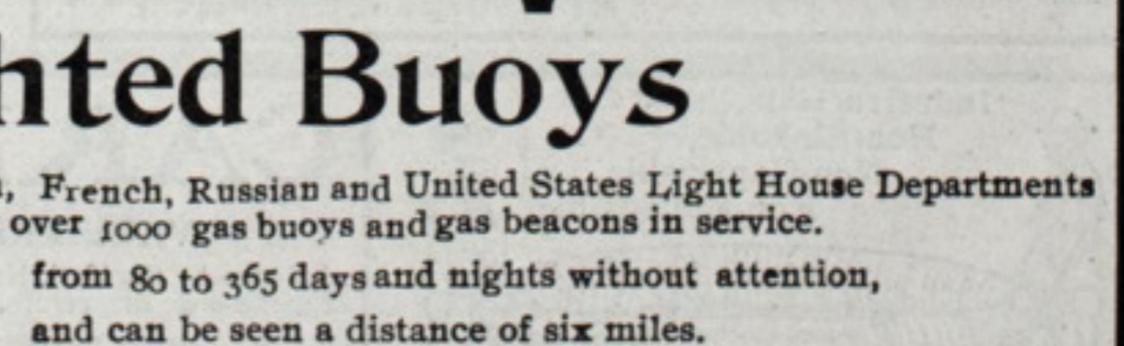
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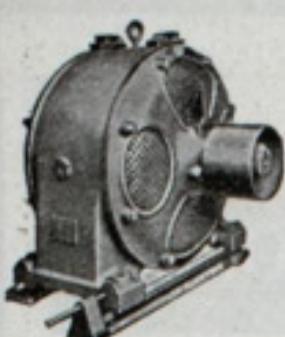
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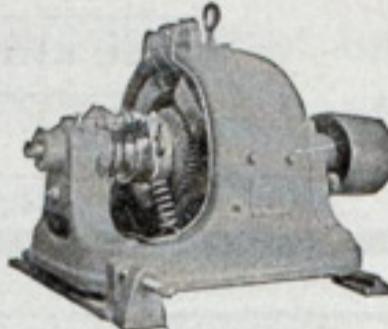


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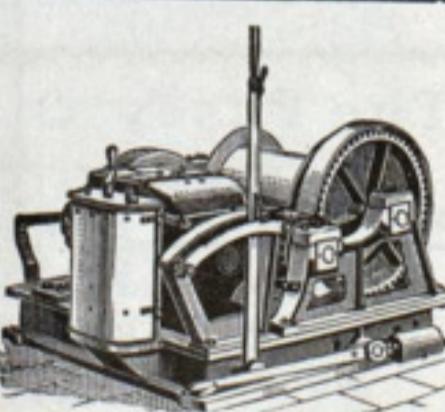
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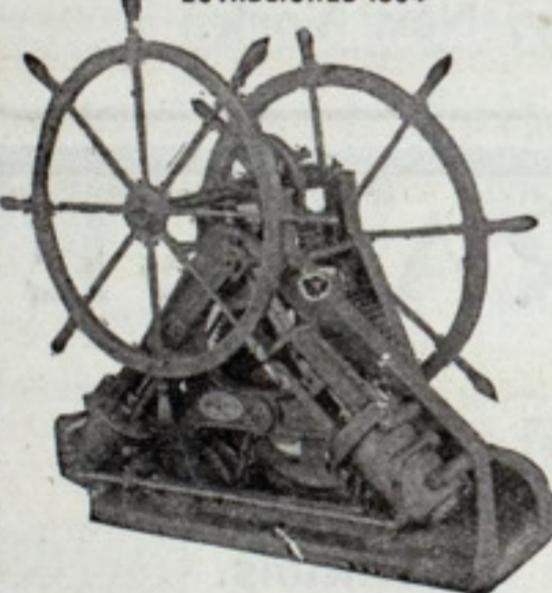
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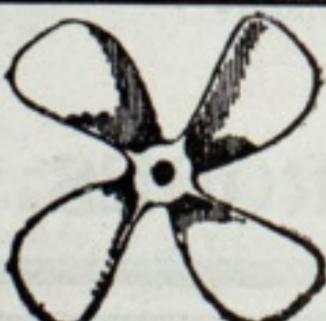
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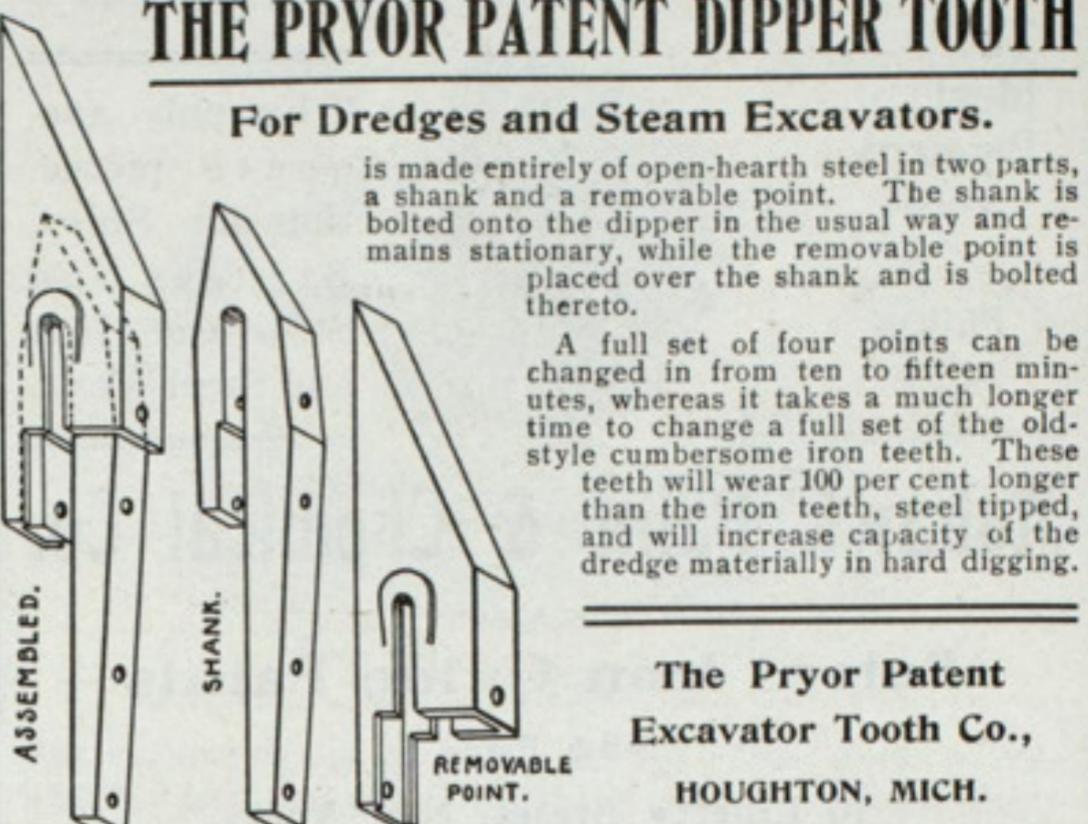
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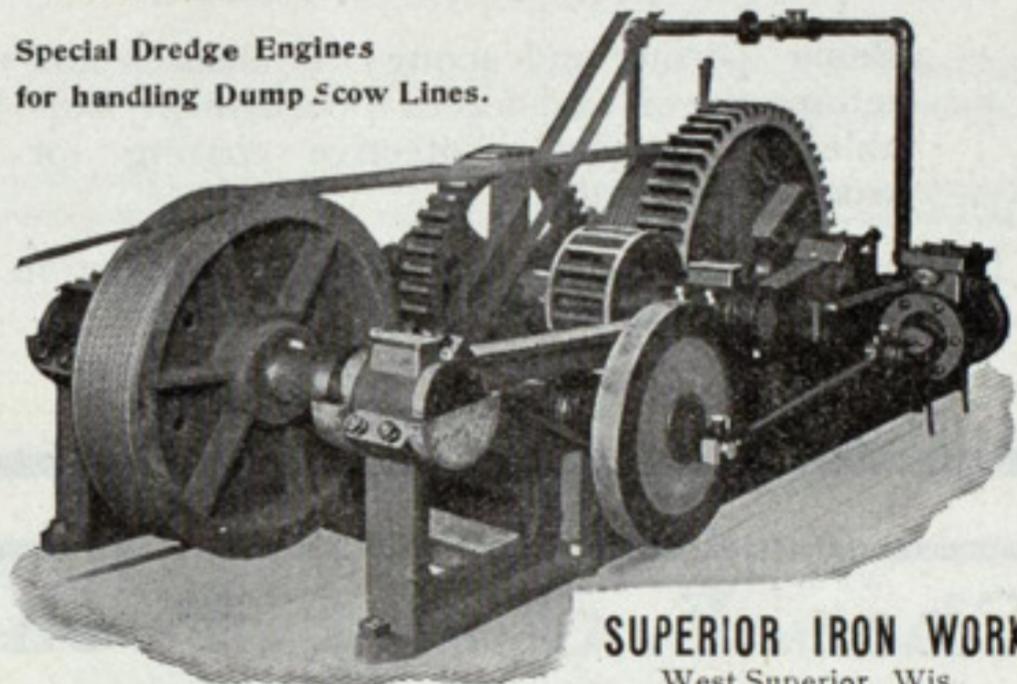
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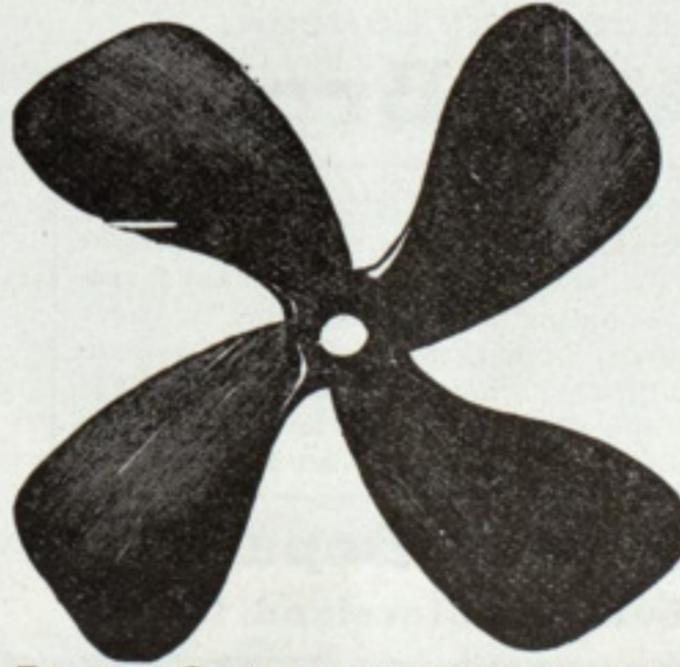
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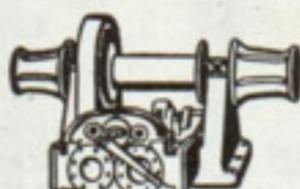
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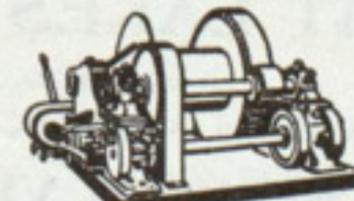
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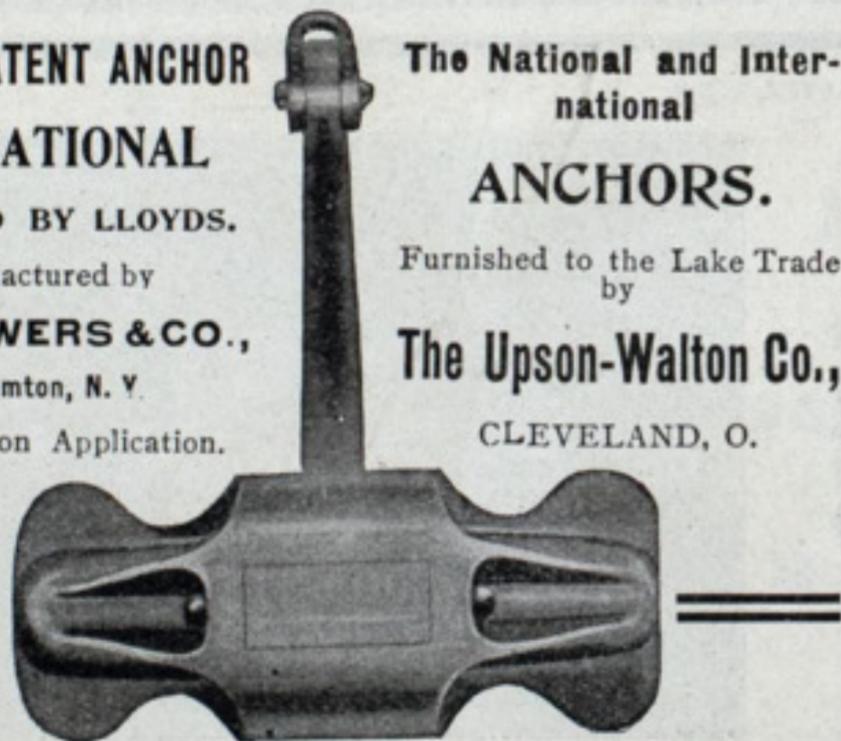
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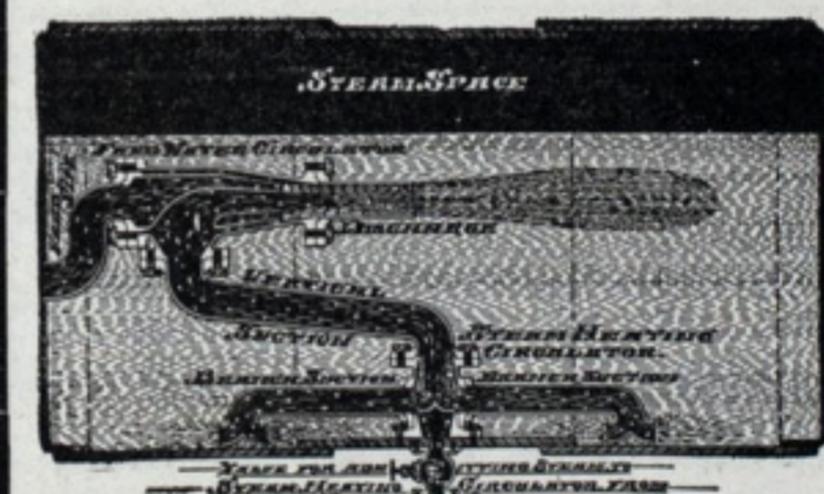
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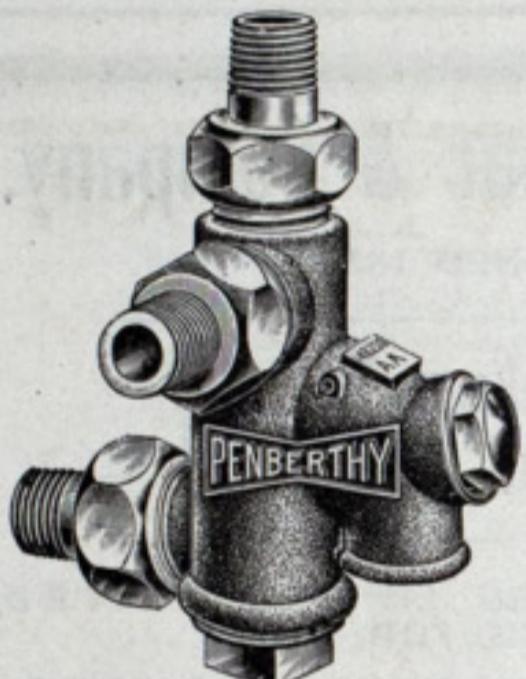
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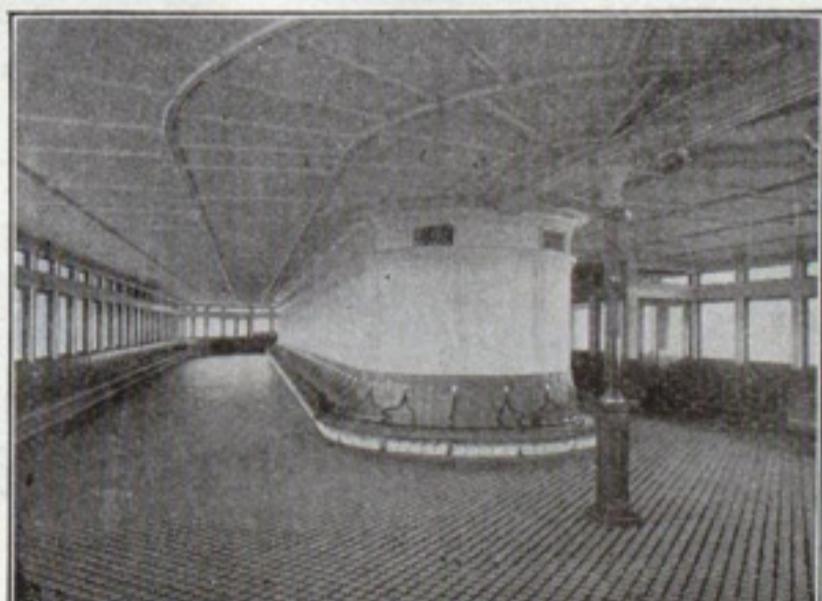
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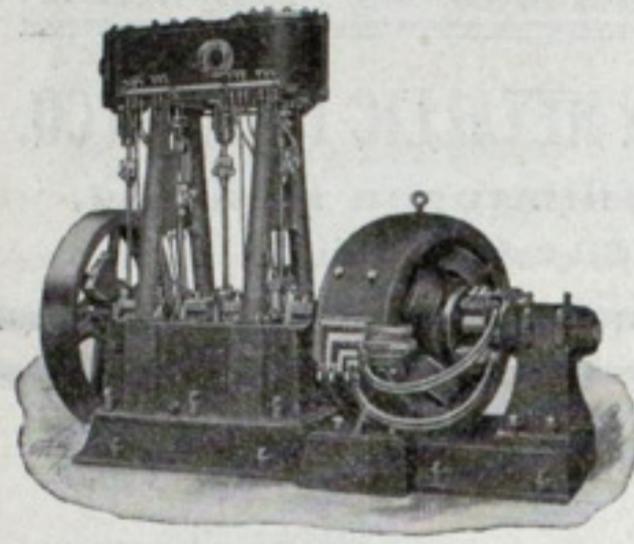
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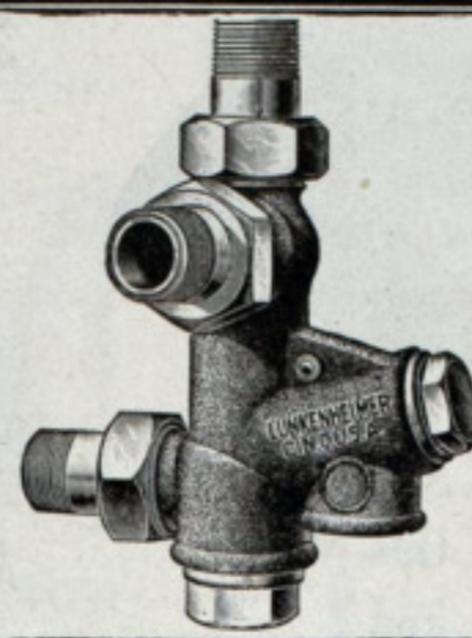
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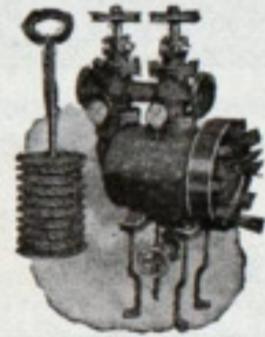
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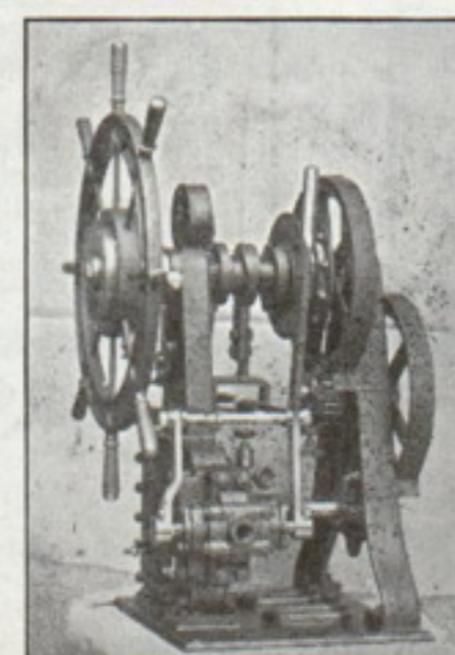
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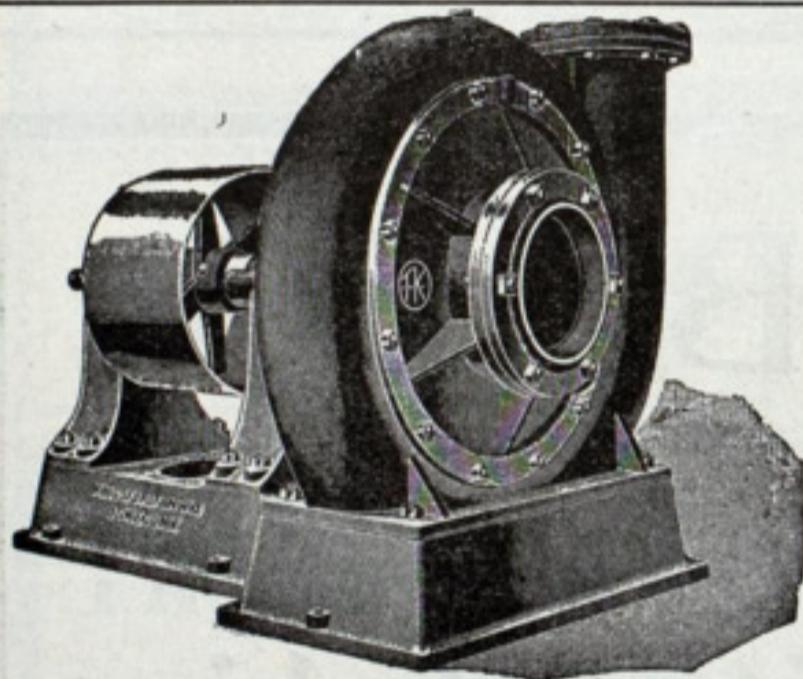
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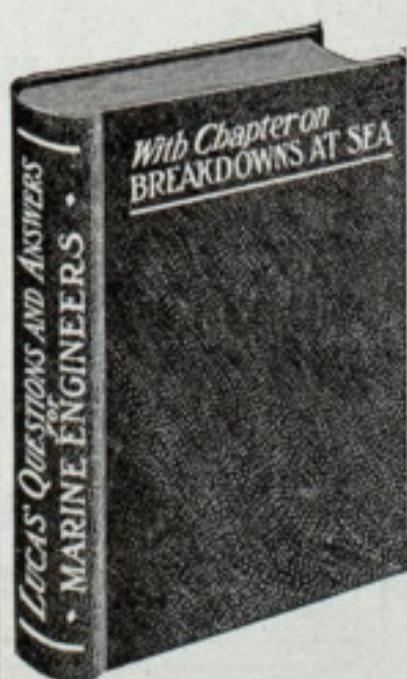
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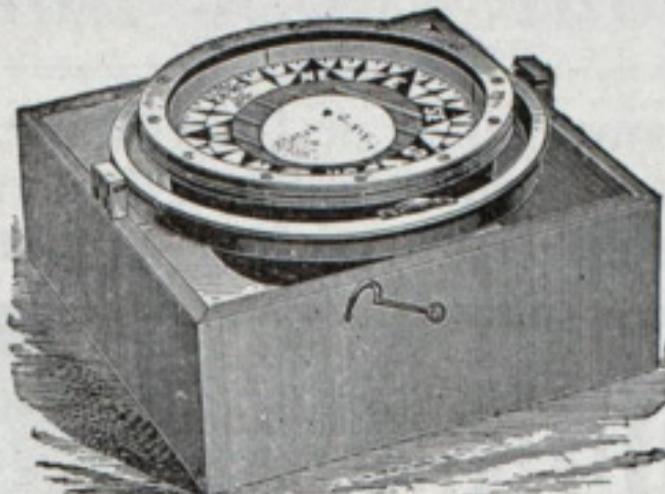
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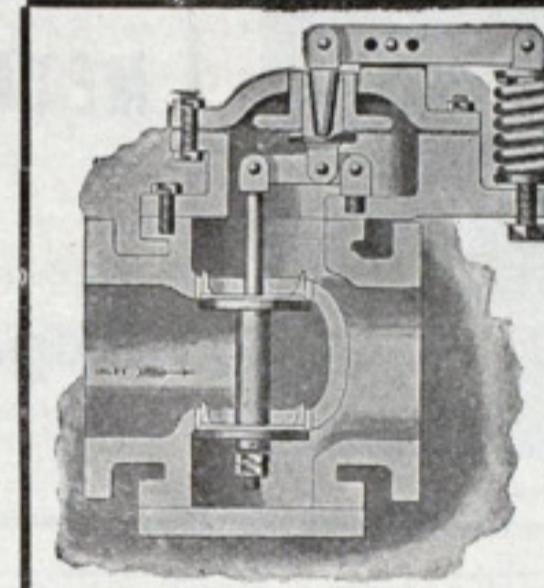
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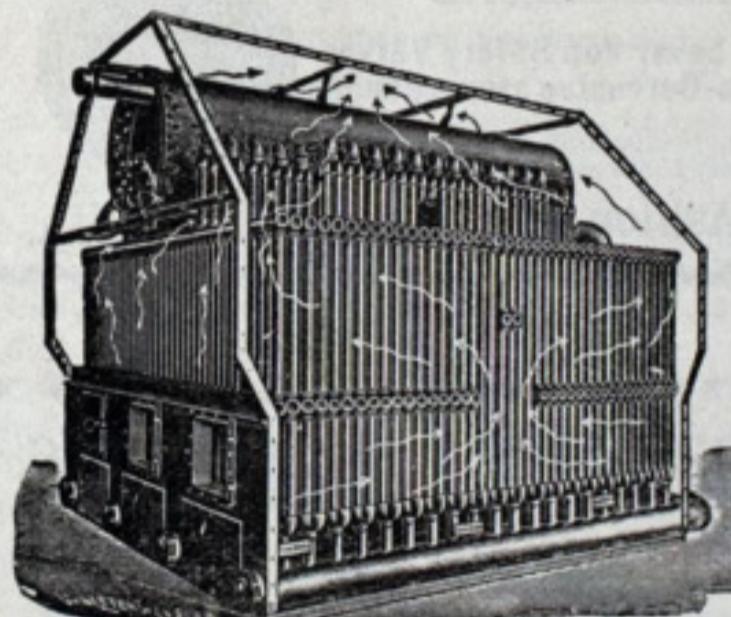
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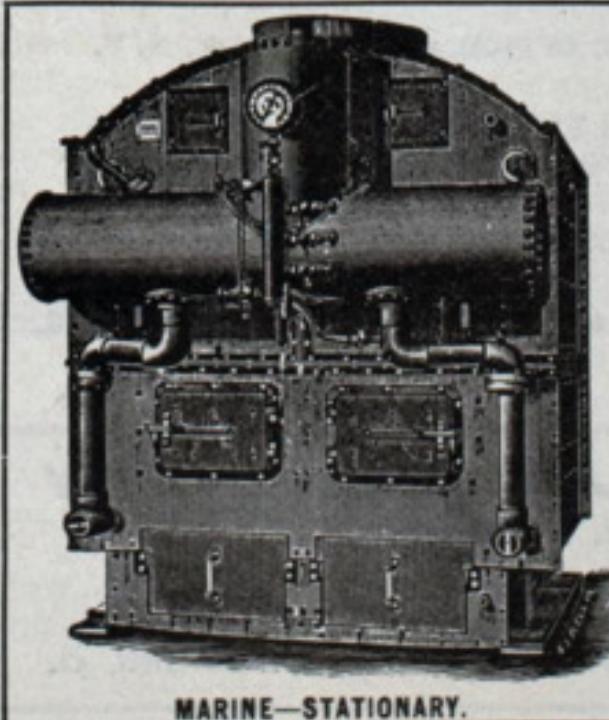
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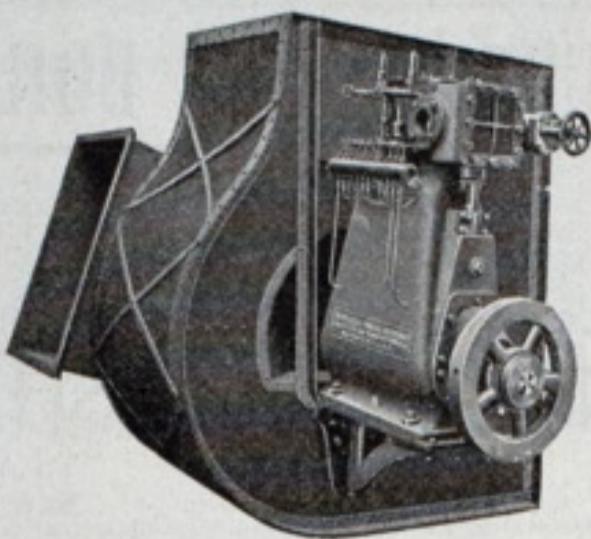
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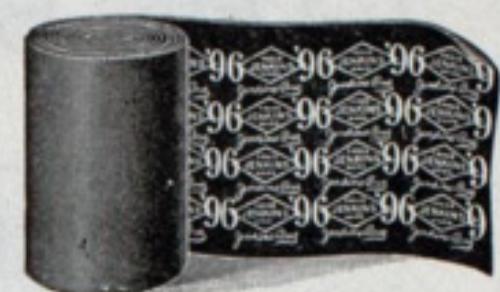
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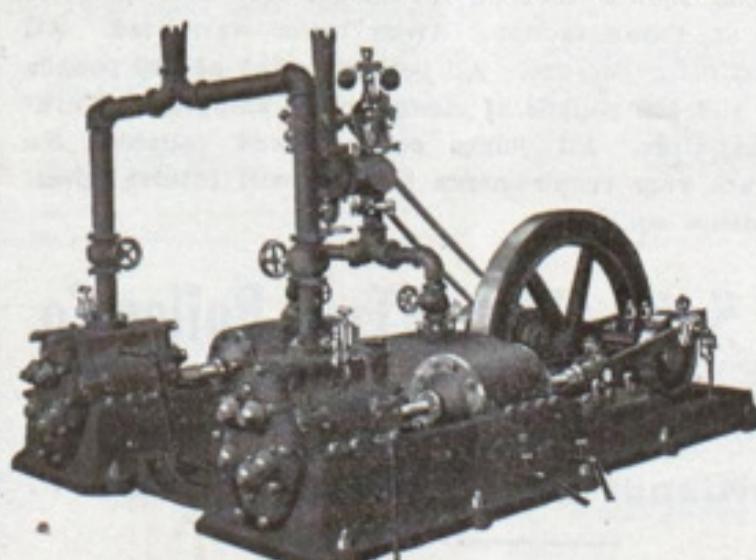
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